”RELAX... GREENTECH WILL SOLVE THE PROBLEM!” SOCIO-PSYCHOLOGICAL MODELS OF RESPONSIBILITY DENIAL DUE TO GREENTECH OPTIMISM

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Summary

In the media and in advertising green technology (”greentech”), including energy-efficient devices, economical cars or renewable energy sources, is often presented as a panacea for environmental problems. However, according to qualitative research findings this optimism can lead to the belief that environmentally responsible behavior on an individual level has no particular importance (Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007; Stoll-Kleemann, O'Riordan, & Jaeger, 2001).

The goal of this dissertation was to model the underlying psychological mechanisms of this phenomenon with quantitative data and based on sound theoretical considerations. For this purpose, a scale measuring ”greentech optimism” was developed and pretested (GTO scale), as described in section 2. The final scale consisted of seven items (5-point Likert scale) and showed good values of internal consistency (Cronbach's $\alpha = 0.814$).

In two studies (sections 3 and 4) the scale was integrated into prediction models for environmentally responsible behavior, which in their broadest terms were derived from the norm activation model (Schwartz, 1977) and the theory of cognitive dissonance (Festinger, 1957). Using structural equation modeling, hypothesized models for responsibility denial mechanisms due to greentech optimism were tested statistically. Whereas study I (section 3) referred to the behavioral field of conservation in households ($N = 642$), in study II environmentally friendly travel was chosen as behavioral field ($N = 169$). Responsibility denial due to greentech optimism was observed in the field of environmentally friendly travel (study II), while for conservation in households (study I) this was not the case.

Summed up (see section 5), the results suggest that greentech optimism weakens individuals' feelings of moral obligation to act pro-environmentally via the two mediators awareness of consequences and problem awareness. However, these negative greentech optimism effects only hold true for situations in which pro-environmental behavior is related to behavioral costs, as in these situations greentech optimism is beneficial to the reduction of feelings of cognitive dissonance, without taking action. Hence, if a critical level of dissonance is present in a situation in which an environmentally relevant decision has to be taken, greentech optimism will weaken the individual's belief that his/her own behavior is important for the solution of environmental problems (awareness of consequences), which in turn will result in a decrease of the individual's feelings of moral obligation to opt for the pro-environmental choice and in consequence in a neglect of the pro-environmental choice. At the same time, greentech optimism decreases the individual's estimation of the significance of the environmental problem (problem awareness), which also affects feelings of moral obligation in a negative way. However, as problem awareness and awareness of consequences are not entirely independent conceptually, their influence on feelings of moral obligation is not additive in nature.

This dissertation contributes to the environmental research by introducing the new attitudinal concept greentech optimism and a reliable and valid scale for the measurement of greentech optimism. Furthermore, it provides valuable insights into processes of environmental responsibility denial due to greentech optimism. In this way, it adds to research on psychological rebound effects. Vital paths for further research are the validation of the GTO scale on a representative sample, the modeling of greentech optimism effects as true intra-individual processes, and research on factors influencing greentech optimism. From the findings of this dissertation the following policy recommendations were derived. To policy makers it is recommended to attenuate negative greentech optimism effects by communication measures in cooperation with media and advertisers. Greentech should generally not be presented as a panacea for the solution of environmental problems. It is important that communication on greentech incorporates the message that responsibility for environmental protection cannot be shifted towards policy makers or technology. Such messages could be elaborated by policy makers, and agreements with media and advertisers could secure their further dissemination. Specific messages could incorporate the explanation of rebound effects or generally refer to the benefits of a sufficient lifestyle for the individual (e.g., the health benefits of walking or bicycling instead of driving short distances). Further policy recommendations are measures aiming at the reduction of behavioral costs of pro-environmental behavior (e.g., providing secure bicycle paths in cities) and measures in favor of a more restrictive use of the label ”greentech” (e.g., use of normative efficiency standards instead of the acknowledgment of any efficiency improvement).

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1 Introduction

1.1 Research motivation

In the media the coverage on climate change mitigation measures is currently dominated by topics related to technological solutions (such as energy-efficient appliances, economical cars, or renewable energy sources), whereas debates on limits to consumerism and sufficient lifestyles lead a wallflower existence (Hänggi, 2008). Additionally, in marketing, ecological values have become an important selling proposition (e.g., energy-efficient cars or home appliances). As a consequence, the semantic relation between climate change mitigation and technology is also very prominent in public advertising. Among the public this constant association by media and advertisers of climate change mitigation through technological solutions may lead to the belief that environmentally responsible behavior on an individual level is not of particular importance, as technological solutions will step in. This optimistic belief in technological solutions for global environmental problems and its behavioral implications are the focus of this dissertation.

According to research findings, faith in technological solutions to environmental problems, can serve as a justification for responsibility denial (Lorenzoni et al., 2007; Stoll-Kleemann et al., 2001). Two studies on attitudes towards different measures of climate change mitigation (Lorenzoni et al., 2007; Stoll-Kleemann et al., 2001) investigated patterns of responsibility denial concerning climate change mitigation with a mainly qualitative approach. Stoll-Kleemann et al. (2001, p. 107) concluded that for the study respondents, changes in personal lifestyles in favor of climate change mitigation seemed to be ”more daunting” than the consequences of climate change. As a consequence, the respondents ”erected a series of psychological barriers to justify why they should not act either individually or through collective institutions to mitigate climate change” (Stoll-Kleemann et al., 2001, p. 107). Likewise, Lorenzoni et al. (2007) were able to detect a wide range of justifications for not taking personal action: ”Indeed, many of our participants agreed that people have personal, social and/or moral responsibilities to address climate change, but often identified reasons for not taking action” (p. 449).

One prominent argument by participants in both studies (Lorenzoni et al., 2007; Stoll-Kleemann et al., 2001) was that responsibility should lie mainly in hands of policy makers and technology. Lorenzoni et al. (2007, p. 452)) concluded that ”many located responsibility for causing and mitigating climate change with others ... or looked to technological solutions ’to save us’”. Stoll-Kleemann et al. (2001) came to the same conclusion: ”The faith in some form of managerial fix is always a comfortable zone for denial. ... from the evidence of the focus groups, this perspective was widespread, both as a hope and as an expectation” (p. 114).

Stoll-Kleemann et al. (2001) assumed, that individuals suffer from feelings of dissonance, being aware that climate change is a threat to be reckoned with and at the same time being unwilling to change current lifestyles. This dissonance is reduced by individuals through denial of responsibility: "To overcome the dissonance created in their minds they created a number of socio-psychological denial mechanisms" (p. 107). One of the socio-psychological denial mechanisms that the two studies revealed is the shift of environmental responsibility from self to policy makers and technology. In-depth exploration and modeling of this responsibility denial mechanism are the aims of this dissertation.

The remainder of this introduction section begins with an overview on the concept of sustainable development and its application in environmental policy (1.2). The subsection on the rebound effect (1.3) broaches the issue of the possible pitfalls of technology-based policy strategies. Finally, formulation of the research goals and a detailed outline of the dissertation (1.4) round up the introduction chapter.

1.2 Sustainable development and green technology

1.2.1 Sustainable development emerges on the political agenda

In 1972 the Club of Rome published its famous report *The Limits to Growth*, in which the authors expressed their concern regarding the trends in population growth, resource use, and pollution (Meadows, Meadows, Rander, & Behrens, 1972). Fifteen years later the Brundtland Commission, appointed by the United Nations (UN), established in its report *Our Common Future* the understanding of the term "sustainable development" (WCED, World Commission on Environment and Development, 1987) that is accepted worldwide today. In its broadest terms the Brundtland report defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, World Commission on Environment and Development, 1987, p. 43). This formulation of sustainable development has come to represent mainstream thinking about the relationship between environment and development (Baker, 2006, p. 6). International organizations, agencies, governments, and regional and local authorities subscribed to the objectives formulated in the report and made commitments to its goals. For example, the Swiss Federal Constitution (Swiss Confederation, 1999, section 4, Art. 73) states: "The Confederation and the Cantons shall endeavour to achieve a balanced and sustainable relationship between nature and its capacity to renew itself and the demands placed on it by the population".

The concept of sustainable development was then subsequently promoted by the UN. In 1992 the first World Summit (United Nations Conference on Environment and Development, also known as "Rio Earth Summit") was held in Rio de Janeiro, which led to the Rio Declaration and the Agenda 21. Ten years later the World Summit on Sustainable Development took place in Johannesburg, and in 2012 the United Nations Conference on Sustainable Development (also known as Rio +20) was again held in Rio de Janeiro. (Baker, 2006, p. 6)

Several internationally binding agreements emerged from the summits, including in 1992 the UN Framework Convention on Climate Change (UNFCCC) and in 1997 the Kyoto Protocol (Baker, 2006, pp. 6-7). The goal to establish a global climate agreement for the period from 2012 (Kyoto Protocol expired) at the 2009 conference in Copenhagen could not be achieved. At the 2011 conference in Durban it was agreed to extend the existing goals until 2020. A new treaty will be prepared by 2015 (United Nations, Framework Convention on Climate Change, 2011).

The two most important characteristics of sustainable development are its conceptualization as a dynamic process and its reference to three pillars: ecological development, social development, and economic development. Hence, sustainable development as a dynamic process "seeks to reconcile the ecological, social and economic dimensions of

development, now and into the future, and adopts a global perspective in this task" (Baker, 2006, p. 5). The social pillar "relates to human mores and values, relationships and institutions", the economic pillar to "the allocation and distribution of scarce resources", and the ecological pillar to "the contribution of both the economic and the social and their effect on the environment and its resources" (Baker, 2006, p. 7). Although there is worldwide consensus about the necessity to take into consideration all three dimensions of development, the priority to be given to each of the three dimensions is still a matter of debate.

1.2.2 Strategies aiming at environmental sustainability

According to Linz (2006) sustainable development can be achieved by the application of the three strategies efficiency, consistency, and sufficiency. Ecological efficiency seeks to minimize the energy demand per unit of use (e.g. liters of gasoline per kilometer, kilowatts per hour of use) through improved technology or organization. Ecological consistency aims at achieving sustainability through establishing processes that unify nature and technology (the most prominent example is recycling). Finally, ecological sufficiency thrives for sustainability by means of behavioral change. It promotes the reconsideration of individual needs and the adoption of more frugal lifestyles. (Linz, 2006)

Since efficiency and consistency are expected to lead to sustainability through technological or organizational improvements alone, they do not demand behavioral change by the individual. However, sufficiency does. In addition to the required changes in individuals lifestyles, sufficiency bears the disadvantage of being suspected to impede economic growth, as it slows down consumption. As a result, the strategy of sufficiency is far less popular among policy makers than are economy-friendly efficiency and consistency (Linz, 2006).

1.2.3 Green technology and its promotion by policy makers, media and advertisers

In the most simple terms green technology or "greentech" can be defined as "any technology that is environmentally friendlier than a comparable existing technology" (Cleantech, n.d.). For the purpose of this dissertation, a simple definition like this is very handy, since the key point of the dissertation is perception of the greentech concept by lay people. Greentech refers to a wide range of technologies. Büchele, Henzelmann, Hoff, and Engel (2009) (as cited in Hoff, 2012, p. 8) name: environmentally sound energy technologies, energy efficiency, sustainable water management, sustainable mobility, material efficiency and sustainable resources, and waste management and recycling. To keep the concept within a manageable scope, in this dissertation the focus is on sustainable mobility (e.g., energy-efficient cars or aircrafts), environmentally friendly power (e.g., solar, wind, bio-

gas), and energy-efficient home appliances (e.g., refrigerators, washing machines, dish washers, entertainment electronics).

As green technologies promise solutions to environmental problems that are compatible with economic growth goals, they are generally popular among policy makers. As an example of an environmental policy strategy on a national level, the following section will provide a short overview of the Swiss environmental strategy after the Kyoto Protocol of 1997.

Example of an environmental strategy at the national level: The case of Switzerland

In 1999 the Swiss Parliament enacted the Federal Act on the Reduction of CO_2 Emissions (CO_2 Act)[1]. The objective of the CO_2 Act was to comply with the CO_2 reduction targets constituted in the Kyoto Protocol, which demanded a reduction of 10 percent between 1990 and 2010 for CO_2 emissions stemming from fossil fuels[2]. The means that are to be applied to achieve the set targets are vaguely defined as "by energy policy, traffic policy, environmental policy, and fiscal policy as well as by voluntary means".

For implementation of the targets of the CO_2 Act the program *EnergieSchweiz*[3] was established in 2001. The program's main objective is the coordination of the measures. These are mainly focused on the promotion of greentech–namely, environmentally friendly power (at first water and later wood, biomass, solar energy, geothermal and ambient heat energy, and wind) and energy-efficient technologies (insulation of buildings, energy-efficient appliances, energy-efficient cars). In 2011 the strategic objectives of EnergieSchweiz were redefined in a communication concept; they are valid until 2020. Generally, the focus remains on greentech. Concerning consumers, the strategy relies on voluntary adoption (e.g., purchase) of greentech. Moral appeals are explicitly excluded:

> The communication of 'EnergieSchweiz' is principally characterised by: focus on benefit and quality of life (and less on code of behavior); focus on lifestyle of a wide public (and not on 'sensitivities' of already committed citizens); information without any moral finger wagging, no appeal for saving. (Nützi, Purro, & Kägi, 2010, p. 9) [freely translated here]

In view of the economic crisis, Swiss authorities and the technical industry further established the Cleantech Masterplan[4] in 2010. The aim is to promote clean technology ("cleantech") innovation in Switzerland for domestic use and for export, in order to create synergies between environmental and economic goals.

[1] see http://www.admin.ch/ch/d/sr/c641_71.html

[2] For combustibles the reduction target was set to 15 percent and for motor fuels to 8 percent. Emissions from aircraft fuels have explicitly been excluded from any reduction targets, international agreements were planned to establish the corresponding reduction targets.

[3] www.energieschweiz.ch

[4] http://www.cleantech.admin.ch/cleantech/index.html?lang=en

Greentech in the media and in advertising

Besides the high appreciation being given by policy makers, greentech is also appreciated by the media as attractive content for reportage. Unlike sufficiency-oriented topics, reports on innovation in the field of greentech are potentially appealing for the media, because in the first place product presentations are event based and allow the integration of actual pictures or footage and the environmental benefit of the technology can be presented in combination with other features (and benefits) of the technology (e.g., appealing design). In the second place, if the producer of the technology innovation has a professional public relations department, the corresponding press release will be designed in a ready-to-use format, which reduces the work load of the editor of the media product.

As Hansen (2010, p. 106) pointed out, technology-related environmental topics "stand a better chance of, first, gaining media attention, and second, of gaining favourable and legitimate media coverage", because they "resonate" well with the "deep-seated" cultural narrative of progress. "Among the 'cultural givens' within much media reporting on the environment is anchored are the beliefs in 'mastery over nature' ... and, in progress through science and technology" (Hansen, 2010, p. 97).

Public perception of greentech is also influenced by advertising in the area of energy-efficient consumer goods (e.g., cars, home appliances). It can be assumed that for economic reasons advertising promoting sufficient behavior (e.g., by NGOs) is far less present in public space.

All in all, concerning environmental problems, the public is exposed much more to technology-based solutions than to solutions that require behavior changes. Referring to the mere exposure effect (Zajonc, 1968), which describes a positive relationship between the frequency of exposure to a stimulus and the appraisal of this stimulus, it is assumed that greentech enjoys a good reputation among the general public. It is reasonable to suppose that optimistic beliefs towards the problem-solving capacity of green technologies are widespread.

Among the shades of the optimism attributed to greentech, one very important phenomenon relevant to energy conservation processes is often neglected: the rebound effect. Already in 1865, an economist detected the phenomenon where improvements in energy-efficiency lead to increased consumption (Jevons, 1965). The next section below will deal in-depth with economic and psychological perspectives on the rebound effect.

1.3 The rebound effect: Economic and psychological perspectives

The first mention of the phenomenon of the rebound effect was made in 1865 by William Stanley Jevons, a British economist who was in charge of estimating coal use as a function of the technical development of steam engines: ”It is wholly a confusion of ideas to suppose that the economical use of fuel is equivalent to a diminished consumption. The very contrary is the truth” (Jevons, 1965, p. 140). Jevons' paradox was taken up independently and more than hundred years later by Khazzoom (1980) and Brookes (1978) (see also Brookes, 1979), who further elaborated on it. Later, Saunders (1992) called their theorizing the ”Khazzoom-Brookes postulate”.

Although known about for 30 (respectively 150) years, ”rebound effects tend to be almost universally ignored in official analyses of the potential energy savings from energy efficiency improvements” (Sorrell, 2009, p. 201). Also independent estimates, such as that in the *Stern Review of Economics of Climate Change* (Stern, 2006), tend to neglect rebound effects (Sorrell, 2009).

The rebound effect is traditionally described, calculated, and explained by economists. Psychological perspectives on the rebound effect are very sparse (Peters, Sonnberger, & Deuschle, 2012; de Haan, 2009). First attempts to understand rebound effects from a psychological point of view have emerged only recently (e.g., de Haan, 2009; Peters et al., 2012). In the following, the classical (economic) point of view as well as psychological perspectives on the rebound effect (mental rebound and moral licensing) will be delineated and discussed. A classification of different forms of psychological rebound effects closes section 1.3.

1.3.1 The classical point of view

Rebound effects can be categorized into direct and indirect rebound effects. Sorrell (2009) defined the direct rebound effect as follows:

> Since energy efficiency improvements reduce the marginal cost of energy services ..., the consumption of those services may be expected to increase. .... This increased consumption of energy services may be expected to offset some of the predicted reduction in energy consumption. (p. 199)

Direct rebound effects are related to increase in the use of a specific energy consuming service or product. The use can either increase in frequency or in intensity. Often used is the descriptive example of car travel. If a car is substituted by a more energy-efficient car, costs per kilometre are cheaper. As a consequence the car is used more often or for longer distances. (Sorrell, 2009)

In addition to the direct rebound effect there exist a number of forms of indirect rebound effects. Cost savings from energy efficiency improvements can lead to ”consumption of other goods and services which themselves require energy to provide” (Sorrell, 2009, p. 200) and generally increase the productivity and growth of the economy. In the long run Sorrell (2009) predicted a shift towards energy-intensive goods and services, because their costs are reduced to a greater extent than the costs of non-energy-intensive goods and services. These effects can also be described as ”secondary effects” (Sorrell, 2009, p. 200).

Within the category of indirect rebound effects but distinguishable from ”secondary effects” is ”embodied” energy: ”The equipment used to improve energy efficiency ... will itself require energy to manufacture and install and this ’embodied’ energy consumption will offset some of the energy savings achieved” (Sorrell, 2009, p. 200).

Photovoltaic cells are an often discussed example of greentech that contains a significant amount of embodied energy. Experts rate the time until the energy needed for the production of photovoltaic cells is regained through the use of the cell at around three to five years, whereas the operating life of the cells is from 20 to 30 years (Photovoltaic, 2010).

The sum of the direct and the indirect rebound effect from an energy improvement is called ”overall or economy-wide rebound effect” (Sorrell, 2009, p. 200). Figure 1 shows Sorrell’s (2009) classification of rebound effects.

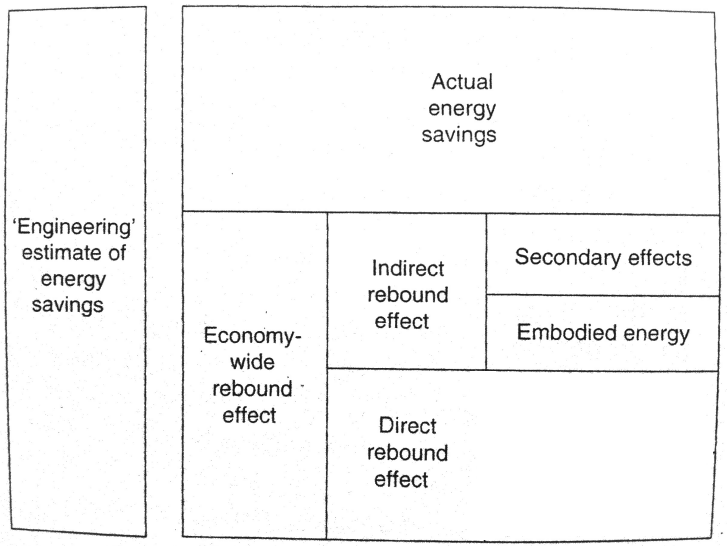

Figure 1: Classification of rebound effects, adapted (simplified) from Sorrell (2009, p. 202)

Generally, the quantification of rebound effects is a challenging issue. Estimations vary a lot and depend on various factors. Sorrell (2009) summarized the estimates for

direct and indirect rebound effects available in 2009 and concluded: ”for most consumer energy services in OECD countries, direct rebound effects are unlikely to exceed 30 per cent” (p. 226). For estimates of indirect and economy-wide rebound effects , Sorrel found that only few studies were available but that ”several studies suggest that the economy-wide effect frequently exceed 50 per cent” (p. 226).

1.3.2 ”Mental rebound” and ”moral licensing”

Human action is guided by monetary costs (e.g., budget that can be spent for daily mobility) as well guided by moral costs (e.g., amount of kilometers (km) driven daily by car considered to be morally acceptable). Changes in the cost-benefit ratio of both monetary or moral costs can lead to changes in intensity and frequency of use. For instance, if the moral costs per driven km decrease due to decreased polluting emissions per km, the acceptable amount of driven km within a certain time period can be expected to increase.

The ”currency” of moral costs was used by de Haan (2009) in his concept of ”mental rebound” (de Haan also called it ”socio-psychological rebound”) (de Haan, Mueller, & Peters, 2006). According to de Haan (2009) mental rebound is rebound that is not caused by saved monetary resources per unit of use. Saved monetary resources can be ruled out as a cause for the rebound effect, when the higher acquisition costs of an energy-efficient technology outweigh the money being saved by its reduced energy use:

> Our concept postulates, that households do mental accounting of environmental load. What is considered to be environmental load may vary a lot and depends exclusively on the world view and the state of knowledge of the household respectively of its decision makers. In this concept the use of energy-efficient technology leads to a reduction of the mental environmental budget, which allows the household other consumption of equivalent environmental load. (de Haan, 2009, p. 15; freely translated here)

Although de Haan et al. (2006, p. 595) explained that it is the reduction of ”social cost and/or psychological cost attributed to the consumption of a given service” that can cause socio-psychological rebound effects, a sound model explaining the socio-psychological mechanisms of mental rebound is lacking in de Haan (2009) and de Haan et al. (2006). To fill this gap, I will now draw on the moral balance model (Nisan, 1991).

The moral balance model (Nisan, 1991) postulates that individuals seek to keep a balance concerning their moral self, permanently keeping track of their actions to maintain their moral self-regard. This balance is sustained by the sum of good deeds and bad deeds (cited by Monin & Jordan, 2009):

> Their goal is not to attain moral perfection, but merely to retain a reasonable level of moral self-regard, allowing for fluctuations as long as one remains above an unacceptable level that would clearly denote immorality. Individuals might thus feel that they can 'afford' to engage in morally problematic behaviors given their accumulated moral credit–or they may feel less compelled to engage in moral behavior if they feel they have already done their good deed for the day. (Monin & Jordan, 2009, p. 348)

Generally, there exist two categories of behavior emerging from a disturbed moral balance: moral licensing and moral compensation. In the case of compensating prior "good deeds" with morally problematic behavior Miller and Effron (2010) spoke of "moral licensing". They define a psychological license as "people's perception that they are permitted to take an action or express a thought without fear of discrediting themselves" (Miller & Effron, 2010, p. 115). However, Zhong, Liljenquist, and Cain (2009) call compensating prior bad deeds with good deeds "moral compensation". Figure 2 illustrates the moral balance model and its two behavioral tendencies.

Figure 2: The moral balance model and its behavioral implications (based on: Nisan, 1991; Monin & Jordan, 2009; Miller & Effron, 2010; Zhong, Liljenquist, & Cain, 2009)

De Haan's mental rebound concept (2009) can now easily be rooted within the framework of the moral balance model. Mental rebound can be interpreted as moral licensing behavior, as it is related to morally problematic behavior emerging from an overweight of good deeds. The latter is represented by the use of an energy-efficient technology. Taking the example of a car: The purchase of an energy-efficient car causes an overweight of good deeds, which in consequence licenses more intensive or more frequent use of the car.

Technically, moral compensation does not fall in the category of rebound effects, as in moral compensation the morally desirable behavior is the consequence rather than

the cause of the morally problematic behavior. Nonetheless, morally problematic behavior that takes place previous to morally desirable behavior can, under particular circumstances, be considered as a form of moral licensing behavior. This may be the case, when the purchase of an energy-efficient technology is planned for the near future. The anticipation of the future purchase of an energy-efficient technology could lead to the belief, that morally problematic behavior in the present will be outbalanced with the future purchase of the energy-efficient technology. As a consequence morally problematic behavior in the present is expected to increase. We can call this particular form of moral licensing "anticipating moral licensing", as the moral license in the present is a product of an anticipated state of moral balance in the future. The anticipation of mental states plays an important role in different decision-making processes, e.g., the anticipation of feelings after a decision for or against helping behavior (Schwartz & Howard, 1981, p. 199). This makes it plausible to assume a type of moral licensing, that is based on processes of anticipation.

Kouchaki (2011) suggested that there is an additional type of moral licensing, "vicarious moral licensing". In this form of moral licensing the morally acceptable behavior is not performed by the persons who show the morally problematic behavior but instead by an in-group member. Thus, it is a vicarious morally desirable behavior that serves as license to behave in a morally problematic way. Kouchaki (2011) showed for discriminatory behavior in different experimental personnel selection tasks that moral licensing effects can not only occur after morally desirable behavior by the acting persons themselves but also after morally desirable behavior by in-group members. If this vicarious moral licensing effect holds true for energy use behavior, then indirect rebound effects of a considerable size are to be expected not only from consumers who have acquired or are about to acquire greentech but also from anybody who is aware of relevant others doing so. In the following, the terms licensing and moral licensing are treated equivalently.

1.3.3 A classification of moral licensing effects

In the context of greentech it appears to be appropriate to distinguish different types of moral licensing effects along two dimensions, one of them being the dimension "direct effects vs. indirect effects". A second dimension is suggested that distinguishes different temporal statuses regarding the acquisition/use of greentech. Along this dimension, licensing effects due to greentech that is already in use should be distinguished from greentech that is planned for use in the near future. If licensing effects emanate from greentech use by others, "vicarious licensing" is the case (Kouchaki, 2011). Vicarious licensing has been added as third category of the second dimension. Table 1 shows the moral licensing types emanating from the combinations of the two dimensions.

The direct licensing effect describes the situation where the acquisition of greentech

(e.g., hybrid car) leads to more frequent/more intensive use of this greentech due to psychological license and the indirect licensing effect represents the situation where the acquisition of greentech leads to more frequent/more intensive use of any energy-consuming product or service due to psychological license (e.g., additional vacation flight).

Whereas the direct anticipating licensing effect describes the situation where the planned acquisition of greentech (e.g., hybrid car) for the near future leads to more frequent/more intensive use of the same type of technology (e.g., an actually owned car) due to psychological license, the indirect anticipating licensing effect represents the situation where the acquisition of greentech planned for the near future leads to more frequent/more intensive use of any energy consuming product or service due to psychological license (e.g., additional vacation flight).

Finally, the direct vicarious licensing effect describes the situation where the acquisition of greentech (e.g., hybrid car) by others leads to more frequent/more intensive use of the same type of technology (e.g., any car) due to psychological license, whereas the indirect vicarious licensing effect represents the situation where the acquisition of greentech by others leads to more frequent/more intensive use of any energy-consuming product or service due to psychological license (e.g., additional vacation flight).

Table 1:
Classification of moral licensing effects along the dimensions 'direct effects vs. indirect effect' and 'Greentech in use vs. Greentech use planned vs. Greentech use by others'

	Direct effects	Indirect effects
Greentech in use	*Direct licensing effect*: Hybrid car is used more than conventional car has been used	*Indirect licensing effect*: Hybrid car leads to additional holiday flights
Greentech use planned	*Direct anticipating licensing effect*: Planned hybrid car purchase increases present car use	*Indirect anticipating licensing effect*: Planned hybrid car purchase leads to additional holiday flights in the present
Greentech use by others	*Direct vicarious licensing effect*: Use of hybrid car by others increases own car use	*Indirect vicarious licensing effect*: Use of hybrid car by others leads to additional holiday flights

The integration of the rebound related research of de Haan (2009), Nisan (1991), Monin & Jordan (2009), Miller & Effron (2010), Zhong, Liljenquist & Cain (2009) and Kouchaki (2011) yielded in the specification of six theoretically plausible categories of moral licensing effects (see Table 1). If among the categories of vicarious licensing the distinction is made between "greentech in use" and "greentech use planned", the number of categories is even eight. Thus, additionally to monetary rebound effects, there exist six (respectively, eight) psychological mechanisms of how estimated energy savings due

to the fostering of greentech might run the risk of being offset partially or entirely. The promotion of greentech by policy makers as a panacea for the solutions of environmental problems might further fuel the described licensing effects, as it affixes an official seal to the neglect of sufficiency-related sustainability.

Psychological licensing related to energy-saving behavior is probably widespread in modern societies and may have a considerable share in rebound effects. Therefore in-depth knowledge about underlying psychological processes is of high value for policy implications in the field of energy-saving behavior. Especially vicarious licensing is expected to be a fruitful and innovative research strand, as it is not restricted to people who themselves use or plan to use greentech, and it potentially applies to the entire general public.

In broadest terms this dissertation will follow the hypothesis that optimistic beliefs concerning the problem-solving capacity of greentech (greentech optimism) weaken individuals' willingness to act in environmentally responsible ways (responsibility denial hypothesis; see section 1.1). As these beliefs also include the assumption that greentech will be used by others, the weakening of environmental responsibility due to greentech optimism can be understood as a process of vicarious licensing. Section 1.4 will now describe the research goals of this dissertation in more detail and provide an outline of the remaining chapters.

1.4 Research goals and outline

1.4.1 Research goals

The first step which has to be taken is the conceptualization of the independent variable. As to date no measure of this kind exists, it has to be developed first. Thus, the first aim is the development of a greentech optimism scale (GTO scale). The second aim is to test the responsibility denial hypothesis (greentech optimism weakens personal responsibility) defined above. As a next step, a psychological process model will be developed and empirically tested. Finally, policy implications will be derived from the results and interpretations. Thus, the following five research goals have been postulated:

1. Develop a GTO scale: Development of a reliable and valid scale that measures optimism towards the problem-solving capacity of greentech.

2. Test the responsibility denial hypothesis: Test of the hypothesis that greentech optimism weakens individuals' willingness to act in environmentally responsible ways.

3. Develop a psychological process model: Theory-based development of a model specifying the underlying socio-psychological processes that lead to the responsibility denial.

4. Test the psychological process model: Inference-statistical test of the psychological process model.

5. Derive policy implications.

1.4.2 Outline of the dissertation

Section 2 describes the development of a GTO scale (research goal 1). Section 3 ("Study I: Greentech optimism and conservation in households") describes the testing of the responsibility denial hypothesis as well as the modeling and testing of the psychological process model (research goals 2, 3, and 4). Some preliminary conclusions and the discussion of necessary model modifications round up section 3. Section 4 ("Study II: Greentech optimism and environmentally friendly travel") describes the adaptation of the GTO scale and the psychological process model for the behavioral sector environmentally friendly travel. In section 5 ("General discussion"), the findings of the two studies are compared and discussed in depth, and practical implications for environmental policy are discussed (research goal 5).

2 Development of a GTO scale

In the introduction section, the concept of GTO was broadly defined as optimistic beliefs towards the problem solving capacity of green technology. This section will describe the process of turning the concept into a measurable scale. At the beginning of the scale construction process, 21 items were formulated and pretested among 40 participants using an online questionnaire. The 21 items consisted of 6 items related to energy-efficient appliances, 6 items related to renewable energy sources, and 9 items related to greentech in general. The goal of the pretest was to narrow the total amount of items to a manageable size of approximately 12 to 15 items. Reliability and factor analysis as well as direct feedback from the participants finally resulted in a scale of 7 items with good internal consistency (Cronbach's α of 0.814 in the pretest and 0.813 in study I). The scale construction process and the resulting scale will be described in greater detail in section 2.2 and section 2.3. First, section 2.1 will present the theoretical assumptions underlying the GTO scale.

2.1 Theory

2.1.1 Definition of greentech

The term greentech was defined in section 1.2.3 as any technology that is environmentally friendlier than a comparable existing technology. Although greentech can also refer to technologies tackling water or land pollution (e.g., waste or water management), in the context of climate change mitigation, the focus of greentech is on energy resources and energy use. In this dissertation the focus is on environmentally friendly power (e.g., solar, wind, biogas), energy-efficient home appliances (e.g., refrigerators, washing machines, dish washers, entertainment electronics), and sustainable mobility (e.g., energy-efficient cars or aircraft).

2.1.2 Definition of optimism

Scheier and Carver (1985) describe optimism as a dispositional trait, that is "defined in terms of generalized outcome expectancies"(p. 219) and that is "stable across time and context" (p. 220). They suggest that in contrast to pessimists, optimists "expect things to go their way, and generally believe that good rather than bad things will happen to them" (p. 220).

Whereas Scheier and Carver's (1985) definition assumes a generalized outcome expectancy relating to the subject, Merriam Webster online dictionary's definition of optimism is not explicitly focused on outcomes affecting the individual itself and does not state that optimism has generalized validity across time and context. Merriam Webster

defines optimism as ”an inclination to put the most favorable construction upon actions and events or to anticipate the best possible outcome” (Optimism, n.d.). Thus, optimism can be conceptualized in less generalized ways than Scheier and Carver’s (1982) definition suggests. Specific types of optimism can relate to the outcomes of different fields of actions or events. One example of a specific type of optimism is ”economic optimism” (Welsh & Young, 1982), which indicates a tendency to expect good development of new businesses as highly probable (cited in López Puga & García García, 2011).

2.1.3 Definition of greentech optimism

Optimism that relates to outcomes of specific sets of events or actions must be conceptualized as a belief rather than as a dispositional trait. A belief is defined as a ”psychological state in which an individual holds a proposition or premise to be true” (Belief, n.d.). In the case of a greentech belief, the individual would expect it to be true that green technologies are capable of solving environmental problems. High positive scores on this belief can be considered ”greentech optimism”. The threshold from which greentech belief scores are judged as greentech optimism is somewhat arbitrary.

Greentech optimism is different from Scheier and Carver’s (1982) optimism concerning the frame of reference (for Scheier and Carver’s optimism, the frame of reference is self-reference; for greentech optimism it is the planet or environment) and concerning the level of the thematic specificity of the outcomes (Scheier and Carver: any action or event in life; greentech optimism: environmental problems).

2.1.4 Related concept I: Technocentrism

A concept of technology-related optimism, technocentrism, was defined by O’Riordan as early as in 1983. O’Riordan (1983, p. 1) defined the ideological theme ”technocentrism” as opposed to ”ecocentrism”. The core assumption of technocentrism is that ”man is supremely able to understand and control events to suit his purpose” (O’Riordan, 1983, p. 1). Technocentrism is ”identified ... by a sense of optimism and faith in the ability of man to understand and control physical, biological, and social processes for the benefit of present and future generations” (p. 11). The ability to ”understand and control” is thereby based on ”organisational and productive techniques” (p. 11). Another key feature of technocentrism is the appraisal of rationality and efficiency (p. 11).

In contrast, the opposed ideology ecocentrism ”preaches the virtues of reverence, humility, and care ... and demands a code of behavior that seeks permanence and stability based upon ecological principles of diversity and homeostasis” (p. 11). O’Riordan summarizes the two ideologies as follows: ”Progress, efficiency, rationality, and control–these form the ideology of technocentrism that downplays the sense of wonder, reverence, and

moral obligation that are the hallmarks of the ecocentric mode" (p. 1).

O'Riordan's conceptualization of the two ideologies of environmentalism constitutes a useful link between policy-oriented theorizing (technology-based strategies vs. sufficiency-based strategies, see section 1.2.2 on policy strategies) and psychological theorizing (values, moral, decision making, behavior). From a policy point of view, technocentrism can be grouped into efficiency strategies that favor technological solutions, whereas ecocentrism is related to sufficiency strategies that favor the reconsideration of needs and the adoption of frugal lifestyles. Table 2 shows for the two ideologies, technocentrism and ecocentrism, the related values, the general means to achieve sustainability, and the corresponding policy strategies efficiency, consistency, and sufficiency.

Table 2:
Technocentrism vs. ecocentrism: corresponding values, means, and policy strategies

	Technocentrism	Ecocentrism
Values	Control, anthropocentrism, optimism, rationality, progress	Care, moral, diversity, homeostasis
Means	Technology, organization, progress, efficiency	Moral obligation, code of behavior, behavioral change
Policy strategies	Efficiency, consistency	Sufficiency

As contemporary predictions on the outcomes of climate change (see Intergovernmental Panel on Climate Change, 2007) are alarming and as contemporary mitigation strategies mainly focus on technology, O'Riordan's reflections on technocentrism are still highly topical and useful as a theoretical basis of the psychology of greentech optimism.

The concept of technocentrism is closely related to the concept of greentech optimism as technocentrism is characterized by the belief that progress in organization and technology will ensure human control over environmental problems. O'Riordan (1983) also mentioned efficiency improvements in technology, speaking of "techniques that produce the most for the last least effort" (p. 11). O'Riordan additionally stated: "The ideology of technocentrism ... downplays ... moral obligation" (p. 1). Hence, O'Riordan was already stating (although in a more general and less psychological way) the responsibility denial hypothesis, which is research goal number 2 of this dissertation (see section 1.4.1).

2.1.5 Related concept II: General confidence

Another concept close to greentech optimism is general confidence. Siegrist, Gutscher, and Earle (2005) conceptualized general confidence as a personality trait and defined it as "conviction that everything is under control, uncertainty is low, and that the world

should unfold as expected" (p. 148). General confidence can be understood as a form of optimism towards the outcomes of any sort of events.

The General confidence scale (Siegrist et al., 2005) consists of three statements which asked the participants about their degree of agreement on a 5-point Likert scale. One of the statements is the following (recoded): "There will be more accidents and catastrophes in the future than we had in the past."

An important characteristic of general confidence is the non-existence of agents who achieve security and control. Unlike the concept of trust, which relates to "persons (or person-like entities)" as objects of trust, "confidence can be had in just about anything" (Siegrist et al., 2005, p. 147).

Greentech optimism can be understood as a specific form of general confidence, as the object of confidence and the benefited entity at risk are defined more specifically for greentech optimism than for general confidence:

- Object of confidence: Whereas greentech optimism refers explicitly to green technology as an object of confidence, general confidence can have anything as object of trust.

- Benefited entity at risk: In the case of greentech optimism it is explicitly the environment that is at risk and that is benefited by the object of confidence (greentech), whereas in the case of general confidence, the benefited entity at risk is general security in the future.

2.1.6 Conclusions from greentech optimism theory

In the section on greentech optimism theory we noted that green technology is "any technology that is environmentally friendlier than a comparable existing technology" (Cleantech, n.d.), and that this dissertation will focus on environmentally friendly power, on energy energy-efficient home appliances, and on sustainable mobility.

Further, we saw that optimism is "defined in terms of generalized outcome expectancies" and that optimists "believe that good rather than bad things will happen to them" (Scheier & Carver, 1985), and that greentech optimism in contrast to general optimism does not refer to self-referencing outcomes but to outcomes concerning the environment.

Finally, the section revealed that with technocentrism there exists a thematically very similar concept (faith in rationality, technology and progress) to greentech optimism and with general confidence a functionally very similar although thematically different concept (belief that risks are under control).

2.2 GTO scale construction procedure

2.2.1 Formulation of items

Besides the belief that greentech has the capacity to solve environmental problems, the scale aimed to capture also the belief that green technology will play a vital role in the future. This belief has been conceptualized as the belief that green technology will enjoy a positive developmental dynamic. The expectation of a positive developmental dynamic of greentech is considered as an essential aspect of greentech optimism. The GTO scale therefore aimed at covering both aspects: problem-solving capacity of greentech (GT_{cap}) and developmental dynamic of greentech (GT_{dev}). The relationship between the two aspects and the overall GTO scale was defined to be multiplicative, as formally described in equation 1:

$$GTO = GT_{cap} * GT_{dev} \tag{1}$$

Two alternative modes of GTO scale construction

To include the two aspects GT_{cap} and GT_{dev} in the scale, the scale can either be constructed of items where each item includes both aspects in combination or of items where each item includes only one of the aspects. However, each mode has advantages and disadvantages that will be discussed later in this section. Both modes were examined in the pretest with the aim of choosing one of them for the main study.

A) Use of GT_{cap} and GT_{dev} in separate items: The GTO measure is achieved by the multiplication of the two subscales by the researcher. It is assumed that this multiplication is also carried out by the individual with mental representations of GT_{cap} and GT_{dev}.

B) Use of items where each item includes both aspects GT_{cap} and GT_{dev} in combination.

Scale construction mode A (GT_{cap} and GT_{dev} in separate items):

The advantage of the construction mode A) is that the respondent does not have to combine two aspects when answering, as the formulation of each item is clearly focused on one aspect. This leads to a strong internal validity of the two subdimensions.

On the other hand, there are some disadvantages: Whereas for the quantification of greentech optimism the two subscales are multiplied by the researcher, it is not sure if the respondent really (consciously or unconsciously) combines mental representations of GT_{cap} and GT_{dev} to something like GTO. As a consequence, the computed GTO is not certain to be a construct that is represented also in the real world, which weakens external

validity. Additionally, this alternative requires more items and more computing work for the researcher.

Scale construction mode B (GT_{cap} and GT_{dev} in combination):

Construction mode B) has the following advantages over mode A): As the respondent has to combine both aspects when answering, the GTO scale items measure directly the greentech optimism that is represented in the mind of the respondent, which leads to a strong external validity of the GTO scale. Moreover, this alternative requires less items and less computing work for the researcher.

However, the disadvantage is that it is not evident to what extent the respondent really focuses on both aspects, as the respondent has to combine two aspects when answering. This weakens internal validity.

The 21 items used in the pretest

In total, 21 items were formulated: seven items addressing GT_{cap}, seven items addressing GT_{dev}, and seven items addressing both GT_{cap} and GT_{dev}. Within these seven items per category, two refer to environmentally friendly power, two to energy-efficient appliances, and three to greentech. Table 3 shows one example for each category of the items classified along the two dimensions greentech subcategory and "GT_{cap} vs. GT_{dev} vs. combination of both". All items were measured using 5-point Likert scales, ranging from 1 (*never true*) to 5 (*always true*).

2.2.2 Pretest

In January 2011 the 21 items were pretested online with 40 participants in Switzerland and Austria (45% women; mean age 27.6 years). The goal of the pretest was to examine:

- which of the two scale construction modes was more practicable; mode A (use of GT_{cap} and GT_{dev} in separate items), or mode B (use of items that each include both aspects GT_{cap} and GT_{dev} in combination)
- if any items had to be excluded or modified.

Factor analysis (principal components analysis, varimax rotation, two factors requested) was carried out with the 14 items that addressed either GT_{cap} OR GT_{dev} to see if the two expected factors could be extracted. The analysis revealed that 11 of the 14 items had been assigned to the expected factor. Among the 11 "correctly" attributed items, factor loadings were $\lambda \geq 0.36$. The two factors had eigenvalues of 2.336 (GT_{cap}), respectively 2.779 (GT_{dev}).

Table 3:
Examples of pretested GTO scale items, classified along the dimensions 'greentech subcategory' and 'GT_{cap} vs. GT_{dev} vs. combination of both'

	Environmentally friendly power*	Energy-efficient appliances*	Greentech**
GT_{cap}	Renewable energy sources do not have the capability of solving the world's energy problems.	Energy-efficient appliances help stop climate change.	The use of green technologies is of particular importance for conservation of the earth.
GT_{dev}	I believe that there is a rapid development concerning renewable energies.	I believe that increasingly energy-efficient appliances are coming on the market.	I believe that green technologies are developing fast.
Combi	As the usability of renewable energy sources is constantly increasing, we will be soon able to stop climate change.	Through the use of increasingly energy-efficient home appliances we will be able to master climate problems.	It makes me feel optimistic for our environment when I think of the developments being made in the field of green technologies.

Note. GT_{cap} = problem-solving capacity of greentech; GT_{dev} = developmental dynamic of greentech; *6 items of this category; **9 items of this category.

Correlation analysis: Three scales for the GT_{cap} items, the GT_{dev} items, and the combination items were computed (mean). The GT_{cap} scale and the GT_{dev} scale were then multiplied. This $GT_{cap} * GT_{dev}$ scale was then tested for correlations (Spearman's coefficient) with the combination scale. In this way it was examined to what extent the combination scale measured the multiplicatively linked aspects GT_{cap} and GT_{dev}. Spearman's ρ of the correlation between the $GT_{cap} * GT_{dev}$ scale and the combination scale was $r_s = 0.496$ (one-sided $p = 0.001$).

Finally, analysis of internal consistency was applied to each of the three scales. The analyses revealed a good value for the combination scale (Cronbach's $\alpha = 0.814$) but weak values for the GT_{cap} scale (Cronbach's $\alpha = 0.627$) as well as for the GT_{dev} scale (Cronbach's $\alpha = 0.576$). The item-scale correlations of the combination scale were higher than 0.541 for five of the seven items. However, two (negatively formulated) items had values of 0.416, respectively 0.467.

The results of the factor analysis indicated, that GT_{cap} and GT_{dev} are perceived of as two different concepts. However, the internal consistency values of the GT_{cap} (Cronbach's $\alpha = 0.627$) scale and GT_{dev} scale (Cronbach's $\alpha = 0.576$) were low. This stands in contrast to the good internal consistency of the combination scale (Cronbach's $\alpha = 0.814$), of which it was shown that it measured to a large extent the multiplicatively linked aspects

of GT_{cap} and GT_{dev} (Spearman's rho with $GT_{cap} * GT_{dev} = 0.496$).[5]

In light of these pretest results and in favor of research efficiency, the decision was made to use the combined items (scale construction mode B) instead of the GT_{cap} items and GT_{dev} items. The items were used in study I without further modifications.

2.3 The resulting scale: Ready for use in study I

For study I the following items[6] were used in 5-point Likert scale from 1 (*never true*) to 5 (*always true*):

a) It makes me feel optimistic for our environment when I think of the developments being made in the field of green technologies.

b) It makes me feel optimistic for our environment when I think of the rapid development being made concerning renewable energies.

c) Despite the development of energy-efficient home appliances we will not be able to cope with climate change. (recoded)

d) Through the constant development of green technologies we will soon be able to cope with climate change.

e) The further development of green technologies won't help stop climate change. (recoded)

f) As the usability of renewable energy sources is constantly increasing, we will be soon able to stop climate change.

g) Through the use of increasingly energy-efficient home appliances (refrigerators, washing machines, etc.) we will be able to master climate problems.

[5]The exclusion of the three non-fitting items of the GT_{dev} improved moderately the scale's internal consistency (Cronbach's $\alpha = 0.64$), but had only a minor effect on the correlation coefficient between $GT_{cap} * GT_{dev}$ and the combination scale (Spearman's Rho = 0.498).

[6]The english wording of the items represents a ad-hoc translation. The original items have been formulated in german and are displayed in appendix C.1

3 Study I: Greentech optimism and conservation in households

3.1 Introduction and outline of study I

With the construction of the GTO scale and the pretest, research goal 1 (development of a reliable and valid scale that measures optimism towards the problem-solving capacity of green technologies) was achieved. However, to make sure that greentech optimism is a reliably measurable and valid construct, the GTO scale had to be validated on a larger sample than just the 40 participants in the pretest. This was done in study I–Greentech optimism and conservation in households–which will be reported in this section.

Research goals 2, 3, 4, and 5 were also targeted in study I. The box below displays the research goals as defined in section 1.4.1.

1. Develop a GTO scale: Development of a reliable and valid scale that measures optimism towards the problem-solving capacity of greentech.
2. Test the responsibility denial hypothesis: Test of the hypothesis that greentech optimism weakens individuals' willingness to act in environmentally responsible ways.
3. Develop a psychological process model: Theory-based development of a model specifying the underlying socio-psychological processes that lead to the responsibility denial.
4. Test the psychological process model: Inference-statistical test of the psychological process model.
5. Derive policy implications.

To achieve the second part of research goal 1 as well as the research goals 2 to 5, study I–Greentech optimism and conservation in households–was carried out in early spring 2011. It consisted of an online survey with 642 participants in Switzerland and Austria and focused on the environmentally relevant behavior of conservation in households. Conservation in households was chosen, as it was assumed to be a behavioral field with a clear-cut set of environmentally relevant behavioral categories. Additionally, no specific target groups had to be defined, as conservation behavior in households affects every person living in a "normal" household.

Section (3.2) below provides the theoretical background for the development of the psychological process model. In section 3.3 the process model is postulated, and hypotheses are specified. A methods section (3.4), a results section (3.5), and discussion section (3.6) follow.

As the results raised doubts about the adequateness of the psychological process model (see sections 3.5 and 3.6), additional theory strings were examined to create a knowledge base for modification of the model and its examination (section 3.7).

Finally, conclusions and defined requirements for a second study, aiming at the validation of the modified model, are postulated in section 3.8.

3.2 Theoretical background

3.2.1 Recapitulation of responsibility denial theory

According to research findings, faith in technological solutions to environmental problems can serve as a justification for responsibility denial (Lorenzoni et al., 2007; Stoll-Kleemann et al., 2001). Stoll-Kleemann et al. (2001) concluded that for the respondents changes in personal lifestyles in favor of climate change mitigation seemed to be "more daunting" (p. 107) than the consequences of climate change. As a consequence, the respondents "erected a series of psychological barriers to justify why they should not act either individually or through collective institutions to mitigate climate change" (p. 107). Likewise, Lorenzoni et al. (2007) detected a wide range of justifications for not taking personal action. One prominent argument by participants in both studies (Lorenzoni et al., 2007; Stoll-Kleemann et al., 2001) was that responsibility should lie mainly in the hands of policy makers and technology. Stoll-Kleemann et al. (2001) assumed that individuals suffer from feelings of dissonance, as they are aware that climate change is a threat to be reckoned with and at the same time are not willing to change current lifestyles: "To overcome the dissonance ... they created a number of socio-psychological denial mechanisms" (p. 107), such as shifting environmental responsibility to policy makers and technology.

A theoretical key concept describing responsibility denial is "moral licensing". It describes the effect that morally problematic behavior follows prior morally responsible behavior. Miller and Effron (2010) defined a psychological license as "people's perception that they are permitted to take an action or express a thought without fear of discrediting themselves" (p. 115). It was theorized in section 1.3.3 that moral licensing may also be of an anticipating nature. This may be the case, when the purchase of an energy-efficient technology is planned for the near future. The anticipation of the future purchase of an energy-efficient technology could lead to the belief that morally problematic behavior in the present will be outbalanced with the future purchase. As a consequence, morally problematic behavior in the present is expected to increase. This particular form of moral licensing will be called "anticipating moral licensing", as moral license in the present is a product of an anticipated state of moral balance in the future.

Kouchaki (2011) described vicarious licensing as a subtype of moral licensing. Kouchaki found empirical evidence that licensing does not only occur in reference to one's own actions but also in reference to actions by relevant others (in-group members). Hence, in the case of vicarious licensing it is someone else's morally desirable behavior that serves as license to behave in a morally problematic way.

Vicarious licensing is hypothesized to play a key role in responsibility denial processes corresponding to greentech optimism. The responsibility denial hypothesis (see sections 1.1 and 1.4.1) postulates that greentech optimism weakens individuals' willing-

ness to act in environmentally responsible ways. Greentech optimism can be understood as license for the neglect of personal responsibility towards pro-environmental behavior. As greentech optimism refers to pro-environmental behavior of other persons and/or institutions, this license is of vicarious character. It is theorized that this vicarious licensing not only refers to the developmental dynamic of green technology that has been witnessed in the past and in the present but also to the anticipation of the developmental dynamic in the future.

3.2.2 Norm-activation model (NAM)

The socio-psychological process model to be tested here will consist of three parts: greentech optimism as the independent variable, a dependent variable representing personal responsibility to behave in an environmentally sound way, and a set of variables that act as mediators (Baron & Kenny, 1986) of the relationship between the independent and the dependent variable.

The independent variable of the model (greentech optimism) was derived theoretically in section 2; the remainder of this current section will specify the dependent variable and the mediators.

The dependent variable: Personal norm

As the dependent variable of the model, the construct personal moral norm was chosen. It is the key construct of the norm-activation model (NAM) (Schwartz, 1977). The NAM was developed in 1977 to explain altruistic behavior. Since then it has been applied several times to pro-environmental behavior (Hunecke, 2000; Bamberg & Möser, 2007). According to Bamberg and Möser (2007), personal moral norms are "feelings of strong moral obligations that people ... experience for themselves to engage in pro-social behavior" (p. 15), and as Schwartz and Howard (1981) specify, they "include both a cognitive component of self-based expectations directing behavior and an emotional component of anticipatory self-satisfaction or dissatisfaction" (p. 191). The emotional component is described as being arousing[7]: "Feelings of moral obligation are emotionally arousing. This arousal–experienced as anticipatory pride or guilt, self-affirmation or deprecation–motivates behavior based on internalized values" (Schwartz & Howard, 1981, p. 192.). Schwartz and Howard (1981) explain the generation of personal norms as follows:

> Briefly, it is assumed that when people face behavioral choices, their value systems are activated. That is, they weigh the implications of the available

[7]This description of this arousal bears a strong conceptual resemblance to the concept of "cognitive dissonance" (Festinger, 1957). According to Festinger such arousal or dissonance could either be dissolved by action or by adding a cognition that helps to justify inaction.

> action alternatives for that set of internalized values which they perceive as relevant. This cognitive process of comparison and evaluation (which may occur either with or without self-conscious awareness) results in the generation of personal norms, feelings of moral obligation to perform or refrain from specific actions. (p. 191)

In the NAM, personal moral norms are seen as direct determinants of pro-social behavior (Bamberg & Möser, 2007). Meta-analyses by Hines, Hungerford, and Tomera (1986/1987) and Bamberg and Möser (2007) found mean correlations between personal moral norms and pro-environmental behavior of $r = .33$, respectively $r = .39$. As these results are strong evidence for the action-guiding quality of personal norms, in study I (Greentech optimism and conservation in households) personal moral norms constitute the dependent variable of the process model. A behavioral measure was not included in the model.

The NAM provides us with a good fitting dependent variable for our model, as the latter aims at describing processes that are expected to include individual moral conflicts.

Hence, with the dependent variable personal moral norm it is possible to target research goal 2, the test of the responsibility denial hypothesis (greentech optimism weakens individuals' willingness to act in environmentally responsible ways). To approach research goals 3 and 4 (development and test of a socio-psychological process model), as a next step mediators between greentech optimism and personal moral norm had to be defined.

The mediators: problem awareness and awareness of consequences

The NAM was useful in the postulation of suitable mediators for our process model. For this purpose, it was necessary to take a closer look at the NAM.

The NAM is divided into four stages: attention, motivation, defense, and behavior (Schwartz & Howard, 1981). Of these stages, the first two are of particular relevance for our process model and will be explained in further detail. In the attention stage, the person perceives if there is need for help (problem awareness), if effective actions exist that would help (awareness of consequences), and if the person has the ability to engage in these actions (perceived behavioral control) (Schwartz & Howard, 1981). In the motivation stage, people, being aware of the problem, the consequences of action and inaction, and their own behavioral control, ask themselves whether according to her own moral standards they are morally responsible for taking action (Schwartz & Howard, 1981). Hence, in this stage, people check the requirements of the situation against their own moral standards, which then leads to the generation of a personal moral norm.

Hunecke (2000) used the NAM to explain pro-environmental behavior. In his "modified NAM" Hunecke conceptualized problem awareness, awareness of consequences

and perceived behavioral control as independent regression factors of the personal moral norm. These three factors could potentially serve as mediators for the process model of this dissertation. In the following, their suitability as mediators will be examined based on theoretical assumptions.

Problem awareness: Referring to the concept of vicarious licensing, greentech can be assumed to act as a relevant other (person and/or institution) that contributes to the solution of the environmental problem. The more that people assume that greentech contributes to the solution of environmental problems, the lower their estimation of the "remaining problem size". It is hypothesized that greentech optimism has a negative effect on problem awareness. Problem awareness was therefore conceptualized as a mediator between greentech optimism and personal moral norm.

Awareness of consequences: Recognizing the fact that environmental problems have the character of a commons dilemma character (Hardin, 1968), it is assumed that the impact of one's own behavior is estimated in comparison to the potential impact of other's behavior and to the potential impact of technological solutions to the problem. The more that people assume that greentech contributes to the solution of environmental problems, the less relevant their own pro-environmental behavior seems, and thus, the lower the estimation of the consequences of her their pro-environmental behavior. It is hypothesized that greentech optimism has a negative effect on awareness of consequences. Hence, awareness of consequences was also established as a mediator between greentech optimism and personal moral norm.

Perceived behavioral control: Whereas problem awareness and awareness of consequences (in the context of general environmental problems) include references of general character, perceived behavioral control is narrow, more individual, and more situation-specific in nature ("To what extent am I able to perform behavior xy?"). It was therefore not assumed, that perceived behavioral control acts as a mediator in our model.

3.3 Postulation of process model and hypotheses

Figure 3 shows the hypothesized socio-psychological process model. Greentech optimism is expected to have a negative influence on problem awareness and on awareness of consequences. In turn, problem awareness and awareness of consequences are expected to have a positive influence on personal moral norm. Hence, greentech optimism is expected to have an indirect negative influence on personal moral norm, mediated by problem awareness and awareness of consequences.

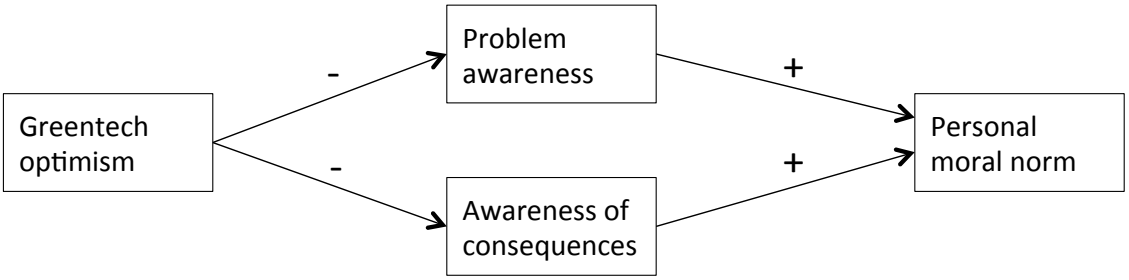

Figure 3: Hypothesized socio-psychological process model describing the influence of greentech optimism on personal moral norm, mediated by problem awareness and awareness of consequences.

The hypotheses of study I–Greentech optimism and conservation in households–were the following:

- H1: Greentech optimism is a valid and reliably measurable construct that is approximately normally distributed among the population of industrialized countries.
- H2: Greentech optimism has a negative influence on personal moral norm (feeling of personal responsibility to show environmentally responsible behavior).
- H3: The negative influence of greentech optimism on personal moral norm is mediated by problem awareness.
- H4: The negative influence of greentech optimism on personal moral norm is mediated by awareness of consequences.

3.4 Methods

3.4.1 General procedure

In March 2011 an online survey was conducted in Switzerland and in Austria using the free online survey tool oFB (provided by SoSci: www.soscisurvey.de). The study was carried out in cooperation with MSc candidate Katharina Weber from the Faculty of Psychology at the University of Vienna (graduated in 2011), who took care of the recruiting in Austria, whereas the author recruited in Switzerland. The recruitment goal was set to 300 persons per country. Various recruiting channels were used, mainly starting from personal networks or related to the two universities. Several online media platforms were asked to display a hyperlink to the online survey, but unfortunately none of them were willing to cooperate. Nonetheless, the targeted 600 participants were reached (N = 642). The online questionnaire consisted of a total of 94 items on 19 pages and was entirely pretested in January 2011.

As the behavioral field, conservation in households was chosen, which is assumed to relate to a clear-cut set of environmentally relevant behavioral categories. An additional practical benefit was that no specific target groups had to be defined, as conservation behavior in households affects every person living in a "normal" household. The choice of conservation in households as the field of pro-environmental behavior investigated had no implications for the operationalization of the GTO scale items, but for the other constructs of the process model.

3.4.2 Operationalization of variables

Within the field of energy conservation in households, behavioral categories had to be chosen that refer to sufficiency-related pro-environmental behavior and NOT to efficiency-related pro-environmental behavior (see section 1.2.2). To meet this demand, categories of pro-environmental behavior were required that (a) do not consist in acquiring or using green technology, (b) bring about a disturbance of comfort, and (c) relate to behavioral decisions that are relevant to anybody in the household. The following behavioral categories were chosen and used in the pretest:

- turning off lights, when not needed
- avoiding stand-by power
- avoiding use of only half-filled dishwasher (or using the dishwasher "eco" cycle)
- washing laundry at the lowest possible temperature
- avoiding the use of the tumble dryer

In the pretest, the results from analyses of internal consistency as well as direct feedback from participants led to the exclusion of all items related to the use of dishwashers. It appeared that dishwasher use was not widespread enough among the participants.

The formulation of the items for the process model variables closely followed the formulations by Hunecke (2000). All items were formulated in German. The item formulations displayed in this section are ad-hoc translations. The original questionnaire is provided in Appendix C.1. All items of the process model were measured using 5-point Likert scales ranging from 1 to 5.

Personal moral norm

For the measurement of the dependent variable "personal moral norm", the following items were formulated (the pretest had shown good internal consistency and had only led to minor changes in wording).

In the following you find different statements relating to power conservation in the household. Please indicate, to what extent the following statements are true (from 1 'never true' to 5 'always true'):

a) My conscience tells me to turn off the light in rooms, where it is not needed.

b) I feel personally obliged to wash my laundry at the lowest possible temperature.

c) I consider it my personal duty to air-dry my laundry, instead of using the tumble dryer.

d) I feel personally obliged to generally save electric power in the household.

e) My conscience tells me to use power economically in everyday life.

f) I feel personally responsible to always turn off electronic equipment completely, not leaving it in the standby mode.'

Problem awareness

The pretest of originally six items had shown good internal consistency for the scale. However, for reasons of research economy, the two items with the lowest item-scale correlation were omitted for the main study. Finally, for the measurement of the hypothesized mediator "problem awareness" the following items were formulated:

Please indicate, to what extent you do agree to the following statements (from 1 'not at all' to 5 'fully'):

a) High consumption of electric power in households contributes significantly to climate change.

b) The increasing consumption of electric power in private households constitutes an environmental problem to be reckoned with.

c) The share of private energy consumption in environmental degradation is being exaggerated by the media. (recoded)

d) The consumption of electric power in private households contributes significantly to the environmental hazards.

Awareness of consequences

Although the pretest of the originally seven items had shown good internal consistency, one item was excluded because of its low item-scale correlation. Additionally, one item relating to dishwashers was excluded. Finally, for the measurement of the hypothesized mediator "awareness of consequences" the following items were used.

Please indicate, to what extent the following statements are true (from 1 'never true' to 5 'always true'):

a) I'm aware that my personal energy saving behavior has an influence on climate change.

b) I can contribute to environmental protection through modest energy behavior.

c) Through consequently turning off unneeded light sources, I can contribute significantly to environmental protection.

d) I believe that I can contribute to environmental protection through avoiding standby power.

e) Through air-drying laundry (instead of using the tumble dryer), I can contribute to the protection of our environment.

Greentech optimism

As already displayed at the end of section 2, greentech optimism was measured as follows:

Please indicate, to what extent the following statements are true (from 1 'never true' to 5 'always true'):

a) It makes me feel optimistic for our environment when I think of the developments being made in the field of green technologies.

b) It makes me feel optimistic for our environment when I think of the rapid development being made concerning renewable energies.

c) Despite the development of energy-efficient home appliances we will not be able to cope with climate change. (recoded)

d) Through the constant development of green technologies we will soon be able to cope with climate change.

e) The further development of green technologies won't help stop climate change. (recoded)

f) As the usability of renewable energy sources is constantly increasing, we will be soon able to stop climate change.

g) Through the use of increasingly energy-efficient home appliances (refrigerators, washing machines, etc.) we will be able to master climate problems.

Control variables: Social norms, feelings of guilt, perceived behavioral control and environmentalism

Besides the variables of the postulated process model, several control variables were measured. Social norms, feelings of guilt, and perceived behavioral control were adapted from Hunecke's (2000) model, and environmentalism was measured with my own German translation of the New Environmental Paradigm Scale (Dunlap, Van Liere, Merting, & Jones, 2000). The items in the German original are provided in Appendix C.1.

Feelings of guilt will play a significant role in the modified process model (see section 3.7). Theoretical considerations as well as the operationalization of the variable "feelings of guilt" are reported in section 3.7.

Demographic variables

To be able to characterize the sample, the following demographic variables were measured: country of residence, age, sex, education, employment status, household size, and household income.

3.4.3 Methods of statistical analysis

To test hypothesis H1, GTO is a valid and reliably measurable construct, which is approximately normally distributed among the population of industrialized countries, the construct was tested for normal distribution using visual methods (Q-Q-plots) and for internal consistency (Cronbach's α). Additionally, confirmative factor analysis (CFA) was applied. The hypotheses related to the process model (H2, H3 and H4; see section 3.3) were tested using structural equation modeling (SEM). SEM is a statistical analysis procedure that makes it possible to test the data fit of models formulated a priori (Bortz, 2005, p. 471). The procedure combines confirmatory factor analysis (CFA) and regression analysis. CFA serves to validate measurement of latent constructs, whereas regression analysis lends itself to estimating paths between the latent constructs. SEM also allows the quantification of indirect effects. SEM was carried out using Mplus, (Version 6, Muthén & Muthén, 1998-2010).

3.5 Results

3.5.1 Description of the sample

Of 935 participants that had started to fill out the online questionnaire, 242 stopped after the first 6 of 19 pages (drop-out rate = 25.88%). Of the remaining 693 participants 642 completed the questionnaire (drop-out rate = 7.36%; total drop-out from first page to last page = 31.34%). Of these 642 participants, 489 have answered all items of the model variables.

Tables 4 and 5 show the sample statistics. Women made up 63.1% of the sample. Mean age was 31.1 years (*SD* = 10.7). 50% of the participants lived in Austria, 43.3% in Switzerland, 5.3% in Germany, and 1.4% elsewhere. More than half of the participants (54.7%) were students, and 95.8% indicated high school, technical college, or university as their highest attained educational level.

Table 4:
Sample statistics I: Sex, age and country of residence (*N* = 642)

	%
Sex	
Female	63.1
Male	36.9
Age*	
16-25	33.5
26-35	46.3
36-45	7.9
46-55	7.0
56-65	3.4
65+	1.9
Country of residence	
Austria	50.0
Switzerland	43.3
Germany	5.3
Other	1.4

Note. **M* = 31.1, *SD* = 10.7

Table 5:
Sample statistics II: Employment status, education (*N* = 642)

	%
Employment status	
Student	54.7
Employee	24.0
Freelance/entrepreneur	5.0
Further education	4.8
Manager	4.5
Retired	2.8
Other	4.2
Highest education	
Elementary school	0.8
Apprenticeship	3.4
High school	46.4
Technical college	4.5
University	44.9

3.5.2 Evaluation of the GTO scale

Before the results of structural equation modeling are presented, special attention will be given to the greentech optimism scale. The scale was first tested for its data fit. Confir-

matory factor analysis (CFA) was carried out to test whether the data fit the hypothesized measurement model for GTO, and whether there are theoretically justifiable model modifications that enhance the model fit. Second, the GTO scale was visually tested for normal distribution (histogram and Q-Q plot), and third, analysis of internal consistency was applied.

Confirmatory factor analysis (CFA) was applied to GTO (N = 578, missings listwise, MLR estimator) and yielded in bad fit indices values (RMSEA = 0.201, CFI = 0.683, TLI = 0.524). With the exception of GTO_5[8], (β = .386) β values were above .5. Modification indices indicated a strong intercorrelation between the error terms of GTO_1 and GTO_2. It was decided to free this relationship and allow an intercorrelation between these error terms, as the intercorrelation could be ascribed to the similar wording of the two items. After exclusion of GTO_5 and the freed error term correlation, fit indices changed for the better (RMSEA = 0.052, CFI = 0.985, TLI = 0.972). The items showed the following β values: GTO_1 = 0.564, GTO_2 = 0.576, GTO_3 = 0.549, GTO_4 = 0.787, GTO_6 = 0.671, GTO_7 = 0.630 (N = 585; error terms of GTO_1 and GTO_2 intercorrelated).

To test whether greentech optimism is approximately normally distributed, two figures are shown for visual testing. Figure 4 shows the distribution of the GTO scale, and Figure 5 shows a Q-Q plot of greentech optimism. In both figures GTO values consist of the mean scores of the items. Analysis of internal consistency revealed a Cronbach's α value of 0.812 and item-scale correlations between .463 (GTO_3) and .659 (GTO_4).

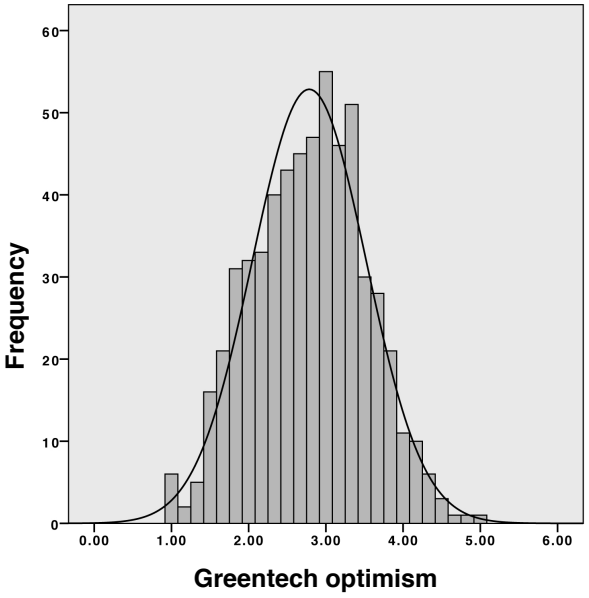

Figure 4: Distribution of greentech optimism (mean scores of items); N = 585, M = 2.78, SD = 0.74

[8]"The further development of green technologies won't help stop climate change.". It appears that the wording of this item was somewhat confusing, as it is negatively formulated.

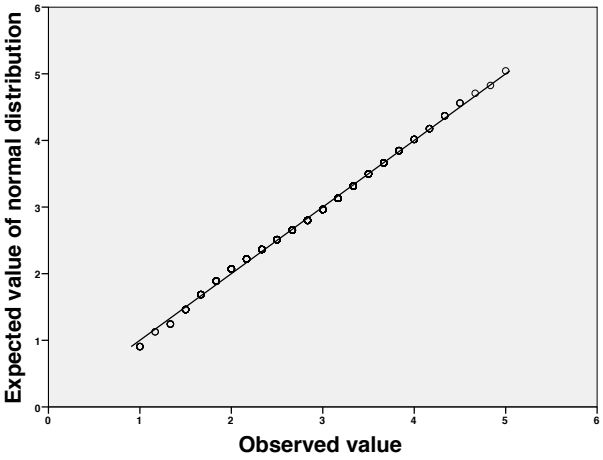

Figure 5: Q-Q plot of greentech optimism (mean scores of items); N = 585

Section 3.5.3 below will provide an overview on the standardized factor loadings of all constructs of the process model. Additionally, means and standard deviations of the items are reported. The process model was tested as a whole with listwise deletion of missing values, leading to a sample size of N = 495. Hence, the sample is smaller than the one used for the evaluation of the GTO scale (N = 585), which leads to slightly different factor loadings of the GTO scale items compared to the ones reported in section 3.5.2.

3.5.3 Descriptives of model constructs

Tables 6 and 7 display the factor loadings of all items as well as means and standard deviations (N = 495, missings listwise; error terms of GTO_1 and GTO_2 intercorrelated).

As reported above, standardized factor loadings of the GTO items ranged from β = 0.524 (GTO_3) to β = 0.786 (GTO_4). The item means showed values between 2.46 (GTO_7) and 3.20 (GTO_1). Standard deviations of the items ranged from 0.972 (GTO_7) to 1.087 (GTO_2).

The standardized factor loadings of the personal moral norm items (PMN) were between β = 0.518 (PMN_3) and β = 0.840 (PMN_5), whereas the means ranged from 3.18 (PMN_2) to 4.31 (PMN_1) and standard deviations from 0.966 (PMN_1) to 1.362 (PMN_3).

Table 6:
Items of greentech optimism and personal moral norm, including their means (*M*), standard deviations (*SD*) and standardized factor loadings (β) (*N* = 495)

Items per scale		*M* (*SD*)	β
Greentech optimism (5-point Likert scale)			
GTO_1	It makes me feel optimistic for our environment when I think of the developments being made in the field of green technologies.	3.21 (1.066)	.573
GTO_2	It makes me feel optimistic for our environment when I think of the rapid development being made concerning renewable energies.	3.18 (1.080)	.558
GTO_3	Despite the development of energy-efficient home appliances we will not be able to cope with climate change. (recoded)	2.57 (1.027)	.524
GTO_4	Through the constant development of green technologies we will soon be able to cope with climate change.	2.74 (0.982)	.786
GTO_6	As the usability of renewable energy sources is constantly increasing, we will be soon able to stop climate change.	2.56 (0.961)	.667
GTO_7	Through the use of increasingly energy-efficient home appliances (refrigerators, washing machines, etc.) we will be able to master climate problems.	2.46 (0.976)	.631
Personal moral norm (5-point Likert scale)			
PMN_1	My conscience tells me to turn off the light in rooms, where it is not needed.	4.31 (0.966)	.561
PMN_2	I feel personally obliged to wash my laundry at the lowest possible temperature.	3.18 (1.292)	.536
PMN_3	I consider it my personal duty to air-dry my laundry, instead of using the tumble dryer.	3.44 (1.362)	.518
PMN_4	I feel personally obliged to generally save electric power in the household.	4.02 (0.977)	.813
PMN_5	My conscience tells me to use power economically in everyday life.	3.88 (0.988)	.840
PMN_6	I feel personally responsible to always turn off electronic equipment completely, not leaving it in the standby mode.	3.58 (1.269)	.647

The βs of the problem awareness items (PA) were between .531 (PA_3) and .874 (PA_4) and the means between 3.42 (PA_1) and 3.87 (PA_2). Standard deviations ranged from 1.028 (PA_2) to 1.111 (PA_3).

The β-value range of the awareness of consequences (AC) items was between .771 (AC_3) and .840 (AC_2) and the mean value ranged between 3.80 (AC_1) and 4.25 (AC_2), whereas standard deviations ranged from 0.937 (AC_2) to 1.130 (AC_1).

Table 7:
Items of problem awareness and awareness of consequences, including their means (*M*), standard deviations (*SD*) and standardized factor loadings (β) (*N* = 495)

Items per scale		*M* (*SD*)	β
Problem awareness (5-point Likert scale)			
PA_1	High consumption of electric power in households contributes significantly to climate change.	3.42 (1.069)	.796
PA_2	The increasing consumption of electric power in private households constitutes an environmental problem to be reckoned with.	3.87 (1.028)	.810
PA_3	The share of private energy consumption in environmental degradation is being exaggerated by the media. (recoded)	3.66 (1.111)	.531
PA_4	The consumption of electric power in private households contributes significantly to the environmental hazards.	3.57 (1.043)	.874
Awareness of consequences (5-point Likert scale)			
AC_1	I'm aware that my personal energy saving behavior has an influence on climate change.	3.80 (1.130)	.780
AC_2	I can contribute to environmental protection through modest energy behavior.	4.25 (0.937)	.840
AC_3	Through consequently turning off unneeded light sources, I can contribute significantly to environmental protection.	3.88 (1.118)	.767
AC_4	I believe that I can contribute to environmental protection through avoiding standby power.	3.92 (1.116)	.826
AC_5	Through air-drying laundry (instead of using the tumble dryer), I can contribute to the protection of our environment.	4.01 (1.045)	.771

3.5.4 Results of structural equation modeling

The hypothesized process model (see figure 6; missings listwise, $N = 495$) showed an acceptable fit (χ^2 (182) = 381.096, $p = 0.000$, RMSEA = 0.047, CFI = 0.952, TLI = 0.945).

Figure 6 shows the standardized structural parameters of the model: The standardized regression weights of the direct factors of personal moral norm (PMN), problem awareness (PA), and awareness of consequences (AC) were β = 0.012 ($p = 0.875$) and β = 0.611 ($p = 0.000$). The path from greentech optimism (GTO) to problem awareness (PA) had a standardized regression weight of β = 0.163 ($p = 0.008$), and the path from GTO to awareness of consequences (AC) was β = 0.258 ($p = 0.000$).

Intercorrelation between PA and AC was β = 0.729 ($p = 0.000$). And, the intercorrelation between the error term of GTO_1 and GTO_2 was β = 0.578 ($p = 0.000$).

The total effect from GTO to PMN was β = 0.255 ($p = 0.000$), of which β = 0.096 ($p = 0.032$) was direct and β = 0.159 ($p = 0.000$) was indirect (via PA and AC). Among the

indirect effects the path via PA was accountable for β = 0.002 (p = 0.875), whereas the path via AC accounted for β = 0.157 (p = 0.000).

Appendix A provides the covariance matrix and the correlation matrix of the latent constructs.

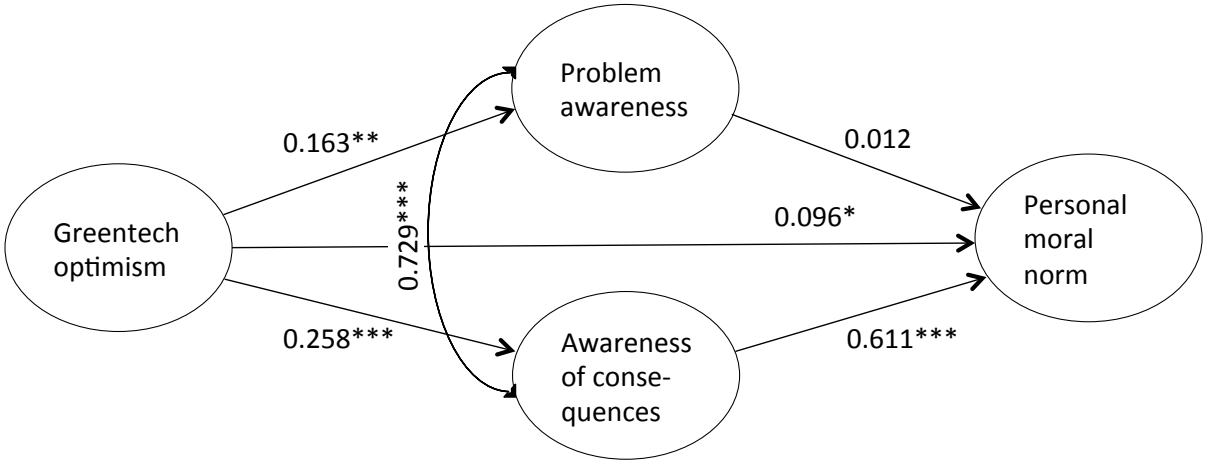

Figure 6: Standardized structural parameters of the process model (SEM, MLR Estimator; missings listwise, N = 495; error terms of GTO_1 and GTO_2 freely intercorrelated)

3.6 Discussion

3.6.1 Summary of the results

The description of the sample indicated that the sample (N = 642) can be characterized as young (mean age 31.1 years), that women are overrepresented in the sample (63.1%), and that the sample consists to a large part of students and highly educated professionals. Given the recruiting channels used–social media, personal networks (of a PhD student and a Master's student in psychology) and university e-mail-lists–this result is not surprising. Unfortunately, the attempt to approach participants from a broader socio-demographic background via online platforms of regional newspapers failed due to lack of interest on the part of the online editorials. Nonetheless, the sample represents students and young professionals from two central European countries.

The GTO scale was then tested for the fit between hypothesized measurement model and the data. After two minor and theoretically justifiable modifications (error term correlation between GTO_1 and GTO_2, and exclusion of item GTO_5), the CFA indicated good model fit (RMSEA = 0.052) and factor loadings above $\beta = 0.549$ (N = 585). Greentech optimism, measured as a latent construct, can therefore be rated as a reliably measurable construct. The visual tests for normal distribution, histogram and Q-Q plot, further indicate that greentech optimism is approximately normally distributed in the sample.

The standardized factor loadings of the items loading on the model constructs PA, AC, and PMN are all above 0.518 (N = 495). Hence, the data fit as well these model constructs. The RMSEA of the complete process model is 0.047 (CFI = 0.952, TLI = 0.945) . The means of the items are mainly distributed around the scale middle category of 3; however, for the items of PMN and AC some means are higher than 4.

On the whole, the measurements of the process model are of good quality, and the results from the structural equation modeling (N = 495) indicate an acceptable fit between the data and the hypothesized process model (RMSEA = 0.047, CFI = 0.952, TLI = 0.945). However, the standardized regression weights of the paths emanating from GTO are of the opposite sign as hypothesized. According the hypotheses, the βs should be negative, but are in fact positive (GTO - PA = 0.163**; GTO - AC = 0.258***; GTO - PMN = 0.096*).

The β of the direct factor AC on PMN is 0.611*** and in line with the hypothesis. As well in line with the hypothesis is the β of the intercorrelation between AC and PA (0.729***). However, the path from PA to PMN has a non-significant β (0.012). It appears that the strong intercorrelation between PA and AC makes the shared variance of PA and PMN redundant. The total effect (direct and indirect effects) from GTO to PMN amounts to $\beta = 0.255$***.

3.6.2 Preliminary conclusions from study I

Whereas the measurement of constructs (including the new construct greentech optimism) has worked successfully, the hypothesized process model has to be rejected. Additional theorizing will now provide a decisional basis for the explorative modification of the model. A modified model will then be postulated and tested. In study II (see section 4), the modified model will be validated with new data.

In section 3.2.1 on responsibility denial theory, cognitive dissonance was introduced as a prerequisite of responsibility denial processes. Stoll-Kleemann et al. (2001) assumed, that individuals suffer from feelings of dissonance, when they are aware that climate change is a threat to be reckoned with and at the same time they are not willing to change their current lifestyles. This dissonance is dissolved by individuals through denial of responsibility. The hypothesized negative influence of greentech optimism on personal moral norm is assumed to appear in the data under the assumption that feelings of cognitive dissonance are present when people deal with their own pro-environmental behavior. Hence, the process model was postulated and tested with the implicit understanding that cognitive dissonance is (consciously or unconsciously) present when a person is dealing with pro-environmental behavior. However, cognitive dissonance was not explicitly integrated in the model. Therefore, it is not certain if participants really experienced feelings of cognitive dissonance when dealing with questions concerning their pro-environmental behavior.

3.7 Model modification

Whereas feelings of cognitive dissonance are to be expected from participants whose levels of pro-environmental behavior do not live up to their moral standards, it is conceivable that some participants do not experience cognitive dissonance at all, as their pro-environmental behavior matches their moral standards exactly (either both behavior and standards are highly pro-environmental or both are hardly pro-environmental).

If cognitive dissonance is a prerequisite of responsibility denial processes related to pro-environmental behavior, the results from the SEM may indicate that a significant part of the participants did not experience strong feelings of cognitive dissonance. Feelings of cognitive dissonance can therefore not be expected to be present under any circumstances. They have to be explicitly integrated in the model.

In the modified model cognitive dissonance has to be integrated somehow. To implement this integration on theoretically solid ground, a section on the theory of cognitive dissonance (Festinger, 1957) as well as a section on the functioning of moderators in correlational relationships will now follow.

3.7.1 Theory of cognitive dissonance (Festinger, 1957)

According to Festinger (1957) cognitive dissonance is ”the existence of non-fitting relations among cognitions” (p. 3). By the term cognition Festinger means ”any knowledge, opinion, or belief about the environment, about oneself, or about one’s behavior” (p. 3). Cognitive dissonance is a ”psychologically uncomfortable” state of mind (p. 3) and can be experienced as ”dramatic” (p. 1). Festinger (1957) compares it to states like hunger, frustration, or disequilibrium (p. 3). The reason why ”non-fitting relations among cognitions” are ”psychologically uncomfortable” lies in the norm of consistency, meaning, that ”the individual strives towards consistency within himself” (p. 1). Because of its uncomfortable effect on the state of mind, cognitive dissonance will ”motivate the person to try to reduce the dissonance and achieve consonance” (p. 3). The more uncomfortable the experience of the dissonance is, the stronger the pressure to reduce the dissonance is (p. 18).

Dissonance can be reduced by changing one of the dissonant elements: ”The simplest and easiest way in which this may be accomplished is to change the action or feeling which the behavioral element represents” (p. 19). For example, if wasting energy leads to a guilty conscience, then stopping wasting energy (a change of behavior) can eliminate the guilty conscience. However, Festinger (1957) points out that changing the behavior is not always possible. It can be too difficult or can even create new dissonances.

Just as dissonant elements related to one’s own behavior can be changed, it is possible to change dissonant cognitions related to the environment. Festinger (1957) offers the

somewhat odd (but catchy) example of a man who suffers from feelings of dissonance, because he, while pacing up and down his living room, always jumps over one particular spot on the floor: ”The cognitive element corresponding to his jumping over that spot is undoubtedly dissonant with his knowledge that the floor at this spot is level ... and strong” (p. 20). The man could have eliminated his dissonance completely by breaking a hole in the floor, as his jumping would then have been consonant with his knowledge that there is a hole in the floor. By breaking a hole in the floor the man ”would have changed a cognitive element by actually changing the environment” (p. 20).

Instead of changing behavior or environmental elements, dissonance can also be reduced by adding new cognitive elements. A smoker can reduce feelings of dissonance by adding cognitions that are consonant with the ”cognition concerning the behavior of continuing to smoke” (Festinger, 1957, p. 21)–such as research findings that question the bad health effects of smoking (p. 21f.). In this way cognitive dissonance is reduced by ”reducing the proportion of dissonant as compared with consonant relations involving that element” (p. 22).

The last mechanism by which dissonance can be reduced also refers to the adding of elements but does not rely on reducing the proportion of dissonant relations. Instead, two dissonant elements can be reconciled. Festinger’s (1957) example here originates from anthropology: The people of Ifaluk (Micronesia) have the firm belief that people are good. This cognitive element is dissonant with the fact that ”young children in this culture go through a period of particularly strong overt aggression, hostility, and destructiveness” (p. 23). The Ifaluk reduce this dissonance by adding a third cognitive element, which allows them to maintain the belief that people are good, despite the knowledge that young children can be aggressive. This element is the belief that malevolent ghosts enter into children and ”cause them to do bad things” (p. 23). As the aggressive behavior does not emanate from the children but from the ghosts, the children are good.

In the modified model, cognitive dissonance will act as a moderator, moderating the relationship between greentech optimism and personal moral norm. Section 3.7.2 below will now explain in further detail what moderation means from a methodological point of view.

3.7.2 Moderators in correlational relationships

Baron and Kenny (1986, p. 1174) define a moderator as ”a qualitative (e.g., sex, race, class) or quantitative (e.g., level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable”.

Regarding the feature explained below moderator variables are distinct from medi-

ator variables: ”Moderator variables always function as independent variables, whereas mediating events shift roles from effect to causes, depending on the focus of the analysis” (Baron & Kenny, 1986, p. 1174). Baron and Kenny (1986) therefore point out that ”it is desirable that the moderator variable be uncorrelated with both the predictor and the criterion ... to provide a clearly interpretable interaction term” (p. 1174).

As Baron and Kenny (1986, p. 1175) clarified, there are three different ways in which the moderator changes the effect of the predictor on the criterion: linear, quadratic, and step . Generally it is assumed that the effect of the predictor on the criterion changes linearly as a function of the moderator. However, this function can also be of quadratic character. The third type of function that can occur is the step function. In this case the effect of the predictor on the criterion changes at a specific level of the moderator. Baron and Kenny (1986) pointed out that it is difficult to specify a priori ”the exact point at which the step in the function occurs” (p. 1175).

In our modified process model it is assumed that feelings of cognitive dissonance moderate the relationship between greentech optimism and personal moral norm. The stronger the feelings of cognitive dissonance are, the stronger the negative influence of greentech optimism on personal moral norm is.

3.7.3 Feelings of guilt as proxy variable for cognitive dissonance

Fortunately, there exists a variable in the data set that can be used as a proxy for cognitive dissonance: feelings of guilt. Hence, the following hypothesis is postulated: The construct ”feelings of guilt” acts as a moderator of the relationship between greentech optimism and personal moral norm.

The variable feelings of guilt (FG) was measured as a control variable by four items. Table 8 shows the standardized factor loadings of the items, together with means and standard deviations of the items. The β values of the items range from .341 (FG_3) to .716 (FG_1), the means from 2.56 (FG_4) to 3.5 (FG_1), and the standard deviations from 1.248 (FG_1) to 1.308 (FG_4). Because of its low β value, FG_3 was excluded from further analyses.

Table 8:
Items of feelings of guilt, including their means (*M*), standard deviations (*SD*) and standardized factor loadings (β) (*N* = 535)

Items per scale		*M* (*SD*)	β
Feelings of guilt (5-point Likert scale)			
FG_1	I have a feeling of guilt about the environment, when I leave unused lights on.	3.50 (1.248)	.716
FG_2	When I leave electronic equipment in the standby mode, I worry about the energy consumption and the related environmental impact.	3.17 (1.304)	.679
FG_3	I don't have feelings of guilt, when I wash my laundry at a higher temperature than needed. (recoded)	3.20 (1.274)	.341
FG_4	When I use the tumble dryer instead of air-drying my laundry, I feel guilty about it.	2.56 (1.308)	.608

3.7.4 Modified model

The modified model was postulated as follows: The relationship between GTO and PMN is negatively moderated by feelings of guilt (FG). The higher the FG, the more the relationship between GTO and PMN turns into negative.

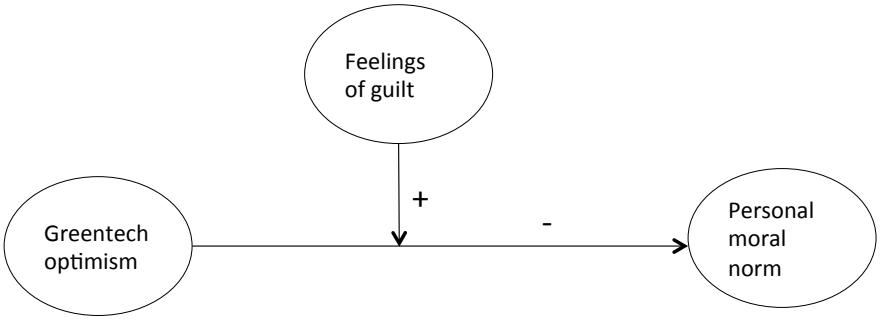

Figure 7: Modified socio-psychological process model describing the influence of greentech optimism on personal moral norm, moderated by feelings of guilt (as a proxy for cognitive dissonance).

3.7.5 Test of modified model

Before the test of the modified model is reported, it is reminded here that the total effect of GTO on PMN in the process model was $\beta = 0.255$ ($p = 0.000$; $N = 495$). In the modified model, this relationship is hypothesized to be moderated negatively by cognitive dissonance. As cognitive dissonance was not measured directly, feelings of guilt will serve as as proxy.

To achieve a clear distinction between the conceptually close constructs[9] FG and PMN, two items were excluded from the PMN construct. The items PMN_1 and PMN_5 relate in their wording to the "conscience" and are too similar to the feelings of guilt items. Without them, the PMN construct represents the moral obligation to act pro-environmentally (without reference to guilt, dissonance or bad conscience). Both FG and PMN represent the end result of a moral balancing process, where internalized moral standards are checked against the requirements of the situation. Whereas FG describe the feelings that are elicited by this moral balancing process, PMN refers to the (morally founded) tendency to act.

The bivariate relationship between GTO and PMN, without the items PMN_1 and PMN_5 appears as follows: The bivariate process model (missings listwise, $N = 563$) shows a good fit (χ^2 (33) = 64.482, $p = 0.008$, RMSEA = 0.041, CFI = 0.977, TLI = 0.969).

The standardized regression weight of the path between GTO and PMN amounts to $\beta = 0.262$ ($p = 0.000$) (unstandardized regression weight $B = 0.282$, SE = 0.059). And, the intercorrelation between the error term of GTO_1 and GTO_2 is $\beta = 0.583$ ($p = 0.000$).

When FG is added to the model as moderator, then the model properties are the following: As Figure 8 shows ($N = 496$), the unstandardized regression weight of the path from GTO to PMN was $B = 0.061$ (SE = 0.065; $p = 0.344$), and B of the path from FG to PMN was 0.786 (S.E. = 0.061; $p = 0.000$). The B of the interaction term FG x GTO on PMN was -0.118 (SE = 0.053; $p = 0.027$)[10]. The intercorrelation between the error term of GTO_1 and GTO_2 was $B = 0.442$ (SE = 0.053; $p = 0.000$).

The interaction plot (see Figure 9) shows that whereas the slope for low FG is positive, it is negative for for high FG. Slope b can be calculated by the equation:

$$b = (PMN_{FGhighGTOhigh} - PMN_{FGhighGTOlow}) \div 2 \tag{2}$$

The moderated regression equation is:

$$PMN = 3.48 + 0.061 * GTO + 0.786 * FG - 0.118 * FGxGTO \tag{3}$$

[9] the items of the two constructs were derived from Hunecke 2000, who originally intended to use all items for the measurement of PMN and then found out that the two constructs have to be used separately.

[10] Whisman and McClelland (2005) suggest to avoid standardized regression coefficients in moderator regression models and report instead unstandardized regression coefficients.

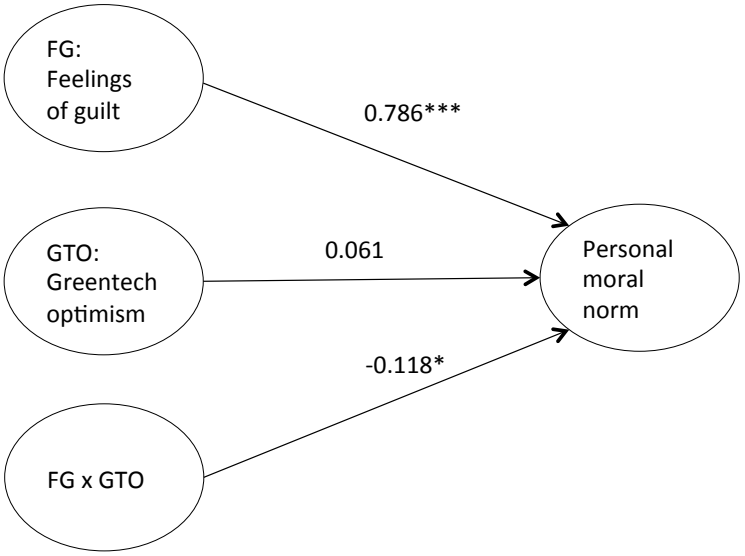

Figure 8: Unstandardized structural parameters of the modified model (SEM, MLR Estimator; missings listwise, N = 496; error terms of GTO_1 and GTO_2 freely intercorrelated)

For high *feelings of guilt* (+ 1 *SD*) and high GTO (+ 1 *SD*) we obtained the following value of PMN:

$$PMN_{FGhighGTOhigh} = 3.48 + 0.061 * (1) + 0.786 * 1 - 0.118 * 1 * 1 = 4.209 \quad (4)$$

For high *feelings of guilt* (+ 1 *SD*) and low GTO (- 1 *SD*) we obtained the following value of PMN:

$$PMN_{FGhighGTOlow} = 3.48 + 0.061 * (-1) + 0.786 * 1 - 0.118 * 1 * (-1) = 4.323 \quad (5)$$

Hence, the slope b for the regression of PMN on GTO for high feelings of guilt was:

$$b = (4.209 - 4.323) \div 2 = -0.057 \quad (6)$$

3.7.6 Switching moderator and factor

From a statistical point of view, the roles of the moderator and the factor are not determined. The model has three independent variables: GTO, FG, and the product term FG x GTO. Hence, in the model the moderator role can also be attributed to the GTO variable, whereas the FG variable takes the role of the independent variable.

The switching of the moderator and the factor in the model also makes sense from a theoretical point of view. FG (as a proxy for dissonance) are positively related to feelings

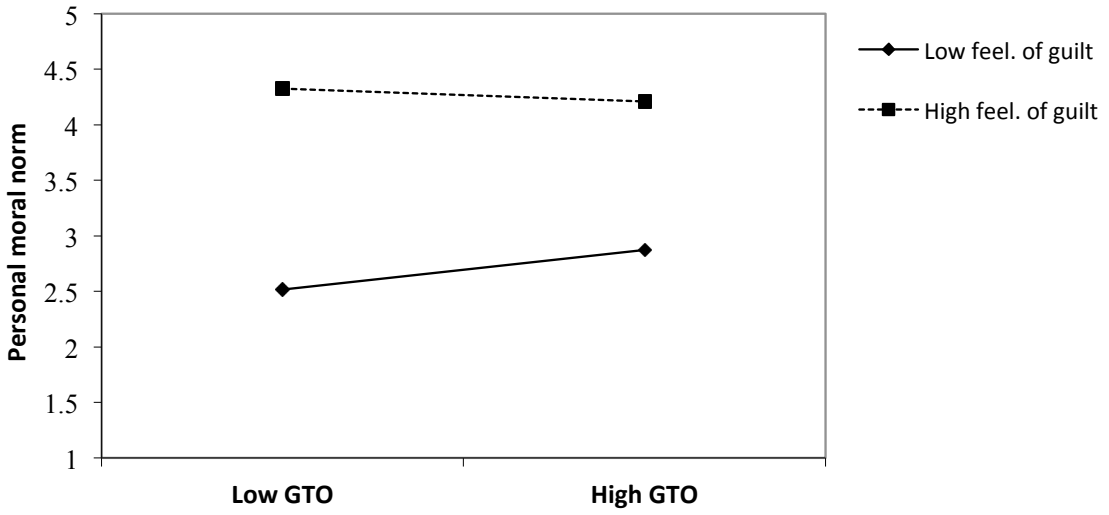

Figure 9: Interaction plot: Regression predicting personal moral norm from greentech optimism for low (-1 *SD*) vs. high (+ 1 *SD*) feelings of guilt.

of personal obligation to act. From section 3.7.1 on the theory of cognitive dissonance we know that cognitive dissonance will "motivate the person to try to reduce the dissonance and achieve consonance" (Festinger, 1957, p. 3) and that the more uncomfortable the experience of dissonance is, the stronger the pressure to reduce the dissonance is (Festinger, 1957, p. 18). One way of reducing the dissonance is behavioral change. Thus, in our model it can be assumed that FG towards the environment can be reduced by showing pro-environmental behavior. As a consequence, a positive relationship between FG and PMN is to be expected.

The role of GTO as moderator in this relationship can be explained by the theory of cognitive dissonance, too, as in section 3.7.1, we learned that cognitive dissonance can also be reduced by adding a new cognitive element that "reconciles" the two dissonant cognitions. Hence, it can be assumed that GTO acts as a cognitive element that reconciles dissonant cognitions concerning the acknowledgement of environmental problems and people's awareness that they are not acting consistently in pro-environmental ways. Therefore, it can be expected that GTO acts as a negative moderator of the positive relationship between FG and PMN. The higher the level of GTO, the smaller the relationship between FG and PMN. Or in other words, the more that people believe in the problem-solving capacity of greentech, the less their FG urge them to show pro-environmental behavior.

This negative interaction is illustrated in Figure 10, where the slope for the FG - PMN path is steeper for low GTO than for high GTO.

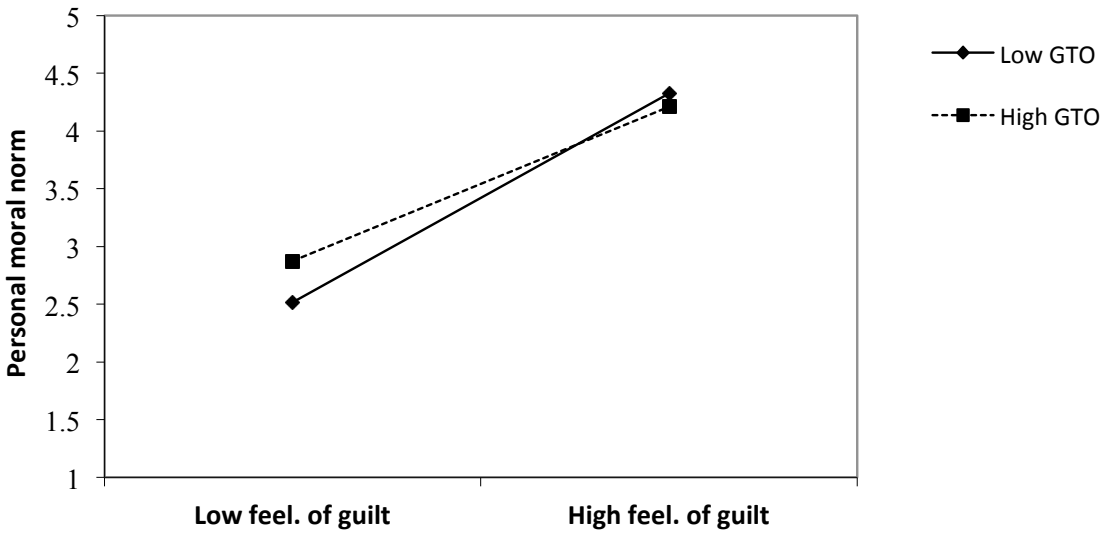

Figure 10: Interaction plot: Regression predicting personal moral norm from feelings of guilt for low (-1 *SD*) vs. high (+ 1 *SD*) GTO.

3.7.7 Conclusions from the model modification

The test of the modified model revealed a significant negative interaction between the two independent variables GTO and FG (B = -0.118*). From this statistical result two different interpretations can be drawn, dependent on the attribution of the roles ”moderator” and ”factor” to the two independent variables.

If the moderator role is attributed to feelings of guilt and the factor role to greentech optimism, the negative interaction can be interpreted as follows: The originally hypothesized negative relationship between greentech optimism and personal moral norm only holds true under the condition that a certain level of feelings of guilt (as a proxy for cognitive dissonance) is existent. Hence, this interpretation lies in the specification of a condition under which the denial hypothesis holds true.

However, if the moderator role is attributed to greentech optimism and the factor role to feelings of guilt, the negative interaction can be interpreted with regard to the explanation of a psychological denial mechanism: Greentech optimism acts as a psychological buffer that reduces the strong relationship between feelings of guilt and feelings of moral obligation to show pro-environmental behavior. It is assumed that this strong relationship is the result of a dissonance reduction process and that greentech optimism allows persons to reduce feelings of dissonance without taking action, as it serves as a handy justification for inaction.

A very similar mechanism was recently described by Keller, Siegrist, Earle, and Gutscher (2011) concerning general confidence[11]:

[11]General confidence is defined as ”conviction that everything is under control, uncertainty is low, and that

> In the present study, general confidence is assumed to act as a psychological buffer against the influence of environmental stress and uncertainties evoked by societal transformations. It is hypothesized that general confidence acts as a moderator of the influence of environmental stressors on psychological strains.... When faced with a societal stressor or threat, persons with high confidence are assumed to perceive less strain than are persons with low general confidence. (p. 2203-2204)

Responsibility denial as a moderation process has also been described by Schwartz and colleagues. A responsibility denial (RD) scale was developed (Schwartz, 1968; Schwartz & Howard, 1980) that measures the acceptance of rationales that justify responsibility denial (Schwartz & Howard, 1981). Several studies showed that RD moderates the relationship between personal moral norm and behavior: "Those likely to deny their responsibility do not behave consistently with their feelings of moral obligation, while those who accept personal responsibility do behave consistently" (Schwartz & Howard, 1981, p. 205). This is, again, an example of a process of negative interaction. However, whereas in the case of the studies by Schwartz and colleagues the denial process takes place as a moderation between personal moral norm and behavior, in the modified model of this dissertation the process of responsibility denial takes place proximate to personal moral norm. Thus, whereas in the studies by Schwartz and colleagues the emphasis is on the mechanism that prevents the implementation of moral behavior, in the modified model it is on in the mechanism that prevents the development of feelings of moral obligation.

the world should unfold as expected" (Siegrist et al., 2005, p. 148). (see section 2.1.5)

3.8 Conclusions from study I and requirements for study II

The evaluation of the GTO scale (see section 3.5.2) showed that GTO has a good internal consistency (Cronbach's α = 0.812) and that the values on the GTO scale are approximately normally distributed. Hence, the first research goal–development of a reliable and valid scale that measures optimism towards the problem-solving capacity of green technologies–was achieved. Hypothesis H1 (Greentech optimism is a valid and reliably measurable construct, which is approximately normally distributed among the population of industrialized countries) can be accepted.

The second research goal–test of the hypothesis, that greentech optimism weakens individuals' willingness to act in environmentally responsible ways–was also completed and revealed that the responsibility denial hypothesis H2 (Greentech optimism has a negative influence on the personal moral norm) has to be rejected, as the bivariate relationship between the two constructs turned out to be positive (β = 0.255).

The test of the developed psychological process model (research goals 3 and 4) revealed that the hypotheses H3 (the negative influence of greentech optimism on personal moral norm is mediated by problem awareness) and H4 (the negative influence of Greentech optimism on the personal moral norm is mediated by awareness of consequences) have to be rejected as well, as there is no negative path from GTO to problem awareness nor from GTO to awareness of consequences. Research goal 5–derivation of policy implications–cannot be achieved at this stage of the research process.

In section 3.7 a thorough evaluation of the two theory strings "theory of cognitive dissonance" and "moderators in correlational relationships" led to the modification of the process model. It was hypothesized that the relationship between greentech optimism and personal moral norm is negatively moderated by feelings of guilt (as a proxy for cognitive dissonance). The modified model was tested and it was revealed that the hypothesis can be accepted (*B* of the interaction term GTOxFG = -0.118*). Thus, the higher the level of feelings of guilt, the more negative the relationship between greentech optimism and personal moral norm is, respectively the more that hypothesis H2 holds true. From this significant interaction also the interpretation can be drawn that greentech optimism serves as a psychological buffer that allows people to reduce feelings of dissonance without taking pro-environmental action.

Hence, the modified model seems to be very fruitful for further investigation. Indeed, for the purpose of gaining generalizable valid findings, further investigation on the modified model is absolutely necessary: Although the model was tested after the formulation of an a-priori hypothesis, it has to be validated with a new data set, as the model was only formulated after a first a-priori formulated process model had to be rejected tested against the current data set. Both models (the original process model and the modified model) are

to be validated against a new data set.

As the hypothesized original process model relies on independent variables (GTO, PA, AC), which are assumed to be relatively stable beliefs over time, a model test between subjects represents a reasonable research strategy. However, the validity of modified process model would benefit from a within-subjects design, as the independent variable, cognitive dissonance, is a state of mind rather than a time-stable belief. Thus, to explain the negative moderator effect of GTO on the relationship between cognitive dissonance and personal moral norm as a genuine intra-individual process, a 2-wave panel design is to be applied in study II, and cognitive dissonance is to be manipulated in a randomized trial between the two waves. However, for the test of the original process model, as in study I a between-subjects model test is the adequate research strategy.

A last requirement for study II is the measurement of pro-environmental behavior, as from the findings of study I it can only be assumed (based on previous research) that feelings of moral obligation to show pro-environmental behavior really lead to the respective behavior. With the inclusion of a behavioral measure it will be possible to test also the denial process described by Schwartz and Howard (1981) (see section 3.7.7), which consists of a negative moderation between personal moral norm and moral behavior by the moderator ”justification for non-action”.

4 Study II: GTO and environmental-friendly travelling

4.1 Introduction and outline study II

4.1.1 Requirements derived from study I

In study I–Greentech optimism and conservation in households–it was concluded that the modified model seems to be very fruitful for further investigation. However, it was also concluded that the modified model has to be validated with a new data set. Hence, a second study had to be designed that meets the following requirements:

a) Cognitive dissonance has to be integrated in the model as an experimentally manipulated independent variable.

b) The study has to employ a two-wave panel design in order to be able to describe genuine intra-personal processes.

c) A behavioral measure has to be added to the model.

d) The role of problem awareness and awareness of consequences as mediators in the greentech optimism–personal moral norm relationship has to be clarified.

4.1.2 Choice of experimental paradigm and of behavioral field

For the experimental manipulation of cognitive dissonance an appropriate experimental paradigm had to be applied. A paradigm that has been used for inducing feelings of cognitive dissonance is the induced hypocrisy paradigm by Aronson, Fried, and Stone (1991).

In this experimental paradigm feelings of cognitive dissonance are elicited by confronting participants with inconsistencies concerning their self-concept (e.g., participants attribute pro-environmental attributes to themselves, but they are made aware of their environmentally damaging travel behavior).

The behavioral field of environmentally friendly travel was chosen, because among students and young professionals frequent and long-distance travel is quite common (Böhler, Grischkat, Haustein, & Hunecke, 2006) as is also the social norm of being concerned about environmental problems. It was expected that among students and young professionals feelings of cognitive dissonance can be induced if they are confronted with their excessive travel behavior.

4.1.3 Outline

The following section on the theoretical background will refer to the induced hypocrisy paradigm. Research questions and hypotheses are then outlined in section 4.3. A methods

section (section 4.4) report the general procedure, the operationalization of variables, and the methods of statistical analysis, followed by the results section (section 4.5) that will cover the description of the sample, descriptives of the model constructs, the manipulation check, and the results of structural equation modeling. Finally, the results of study II are summed up and discussed in section 4.6.

4.2 Theoretical background: How to induce cognitive dissonance

Aronson et al. (1991) proposed the induced hypocrisy paradigm as an intervention tool to improve condom use among young adults. Feelings of hypocrisy can be induced by making persons aware of inconsistencies between what they advocate in public and their actual behavior: "Recent theorizing suggests that being confronted with the fact that you are not practicing what you preach induces feelings of hypocrisy, which is a form of cognitive dissonance" (Aronson et al., 1991, p. 1636). Aronson et al.'s study (1991) showed that confronting students with their past failure to use condoms consistently increased future condom use but only under the condition that the students had to advocate condom use in public beforehand. Hence, Aronson et al. suggested that it was the feeling of hypocrisy that made them act more responsibly.

Aronson (1992) explained that feelings of cognitive dissonance arise when the self-concept is under threat. The preservation of a healthy self-concept is a highly valued goal of the individual. According to Aronson, the self has to be maintained as (a) constant, stable, predictable, (b) competent, and (c) morally good. Hence, Aronson (1992) distinguished three categories of threat for the self-concept: "[I]n shorthand, what leads me to perform dissonance-reducing behavior is my having done something that (a) astonishes me, (b) makes me feel stupid, or (c) makes me feel guilty" (p. 305).

Some years earlier, Kantola, Syme, and Campbell (1984) conducted an experiment in order to test if the induction of dissonance could serve as an intervention tool in the field of energy conservation. In the experiment, 203 participants (high consumers of electricity) were randomly assigned to three experimental conditions and one control condition. In the "dissonance group" participants were informed after a two-week period of electricity-use measurements "that they were high consumers and that they had said in the earlier survey that they felt it was their duty to save electricity" (Kantola et al., 1984) (p. 418). Additionally, they received tips to conserve energy. The other two experimental groups received only tips and consumption feedback, respectively only tips. As hypothesized, in electricity-consumption measurements two-weeks later, the dissonance group conserved more energy than the other two experimental groups and more than the control group, indicating that making electricity consumers aware of inconsistencies between their expressed attitude and their behavior increases conservation behavior.

Hence, without referring to each other, the studies by Kantola et al. (1984) and Aronson et al. (1991) used the same paradigm for the fostering of socially desirable behavior. In both studies, the induced hypocrisy paradigm makes use of the dissonance inducing quality of a threatened self-concept to promote socially desirable behavior. However, in this dissertation the promotion of socially desirable behavior is not the central goal. The randomly controlled induction of feelings of cognitive dissonance is used to be able

to make unambiguous predictions on the role of cognitive dissonance in the greentech optimism-personal moral norm relationship.

4.3 Research questions and hypotheses

In study II–Greentech optimism and environmentally friendly travel–the following research questions will be answered:

1. Does the modified process model from study I fit the data set of study II?
2. Can the modified process model from study I be supplemented with a behavioral measure that is significantly influenced by personal moral norm?
3. Do the data from study II allow confirmation of the (in study I rejected) hypotheses that problem awareness and awareness of consequences act as mediators in the GTO-PMN relationship?
4. What are the policy implications that can be derived from the results?

These research questions lead to 13 hypotheses for study II "Greentech optimism and environmentally friendly travel" which can be grouped into three sections. The first section consists of hypothesis H1, which refers to the quality of the greentech optimism construct. The second section comprises hypotheses H2 to H8, which consider greentech optimism a negative factor of personal moral norm and indirectly of pro-environmental behavior. Finally, the third section comprises hypotheses H9 to H13. These hypotheses consider greentech optimism a negative moderator of the relationship between cognitive dissonance and personal moral norm and between personal moral norm and pro-environmental behavior:

Hypothesis H1: Quality of the greentech optimism construct

- H1: Greentech optimism is a valid and reliably measurable construct that is approximately normally distributed among the population of industrialized countries.

Hypotheses H2 to H8: Greentech optimism as a negative factor

- H2: Greentech optimism has a negative influence on the personal moral norm (feeling of personal responsibility to show environmentally responsible behavior).
- H3: The negative influence of greentech optimism on the personal moral norm is mediated by problem awareness.
- H4: The negative influence of greentech optimism on the personal moral norm is mediated by awareness of consequences.
- H5: Personal moral norm has a positive influence on pro-environmental behavior.

- H6: Greentech optimism has an indirect negative influence on pro-environmental behavior, via personal moral norm.

- H7: The negative influence of greentech optimism on the personal moral norm is moderated by cognitive dissonance.

- H8: The negative influence of greentech optimism on pro-environmental behavior is moderated by cognitive dissonance.

Hypotheses H9 to H13: Greentech optimism as a negative moderator

- H9: Cognitive dissonance has a positive influence on personal moral norm.

- H10: The positive influence of cognitive dissonance on personal moral norm is negatively moderated by greentech optimism.

- H11: The positive influence of personal moral norm on pro-environmental behavior is negatively moderated by greentech optimism.

- H12: Cognitive dissonance has a positive influence on pro-environmental behavior.

- H13: The positive influence of dissonance on pro-environmental behavior is negatively moderated by greentech optimism.

4.4 Methods

4.4.1 General procedure

In May and June 2012 169 persons participated in a two-wave study. The participants first filled out an online questionnaire (www.limesurvey.org) that covered the model and control constructs and also contained a section on past travel behavior (the study had a cover story: it was advertised as "travel study"). One week later they were invited to the department of psychology laboratory at the University of Zurich, where half of them (experimental group; $N = 79$) underwent a dissonance inducing treatment using data from the first questionnaire. Subsequently, they filled out the second online questionnaire in the lab. Maximally six participants could participate in the lab at the same time. The two questionnaires are provided in Appendices C.2 and C.3.

Recruiting and contact management

A-priori conducted power analysis (G∗Power 3.1) indicated a sample size of $N = 150$ necessary to detect an interaction effect of $f^2 = 0.042$[12] with a power of 1 - $\beta = 0.8$. To achieve a final sample of $N = 150$, an oversampling of 20% ($N = 180$) was aimed for in the recruitment.

The study was advertised on several recruitment channels. University e-mail lists were used and print notices were posted on different campuses of the University of Zurich and the Federal Institute of Technology (Zurich, Switzerland). Additionally, an advertisement was posted on www.ronorp.net, a popular local online platform. As an incentive, participants were asked to either choose between 25 Swiss francs (21 euros) or–if they were students at the psychology department–one credit point for participation in experiments.

In the recruitment ads participants were provided with a hyperlink to a Doodle poll[13] and invited to choose a time slot for the second part of the study (in the lab). Their contact data (which were invisible to other participants) were then retrieved from the Doodle schedule, and participants were contacted 10 days before their appointment per e-mail. In this invitation e-mail they were sent a personalized hyperlink to the first online questionnaire and requested to fill out the questionnaire within the next three days. If the questionnaire had not been filled out after three days, participants were sent a reminder per e-mail.

200 participants registered in the Doodle poll for participation. Of these, 190 filled out questionnaire 1 (95%, drop-out = 5%). Of the 190 remaining participants, 169 showed

[12] It has been assumed that in the experimental setting, a higher interaction effect than in the quasi-experimental setting of study I can be expected. It has been expected that the interaction term will explain 4 % of the variance of the dependent variable PMN.

[13] www.doodle.com is a free internet calendar tool for the coordination of meetings.

up at the department of psychology for the second part of the study (88.95%, drop-out = 11.05%). The total drop-out rate from registration in the doodle poll (N = 200) to the completion of the study in the lab (N = 169) was 15.5%.

Cover story

Participants were recruited using the cover story "travel study". Using this cover story was expected to bring about several advantages:

First of all, the cover story allowed the researcher to collect unbiased information about past travel behavior. This information was subsequently used to create an individualized treatment text that was placed on the introduction screen of questionnaire 2. Second, the cover story was expected to distract the participants to a certain extent from the topic of pro-environmental behavior, which should reduce the social desirability bias. Third, for students and young adults traveling is generally an attractive topic. As the study was quite time-consuming for the participants, recruiting was expected to be difficult. Hence, an attractive topic could only be of help. Further, it was expected that especially participants with extensive travel behavior would be attracted, which in turn enhanced the chance of achieving an effective dissonance treatment. Finally, the travel topic served for the creation of an elegant behavioral measure. Pro-environmental behavior was measured at the very end of questionnaire 2 by way of asking the participants their preference concerning a prize in a (real) lottery, which was a travel voucher (value: 300 Swiss francs, 250 euros). Participants could choose between a voucher from the Swiss Federal Railways (SBB) or the Swiss International Airlines (Swiss). If the railway voucher was chosen, behavior was coded as pro-environmental, and if the airline voucher was chosen, behavior was coded as not pro-environmental.

Procedure in the lab

Participants were met at the meeting point in the entrance hall of the department of psychology and walked to the experimental lab. There they were requested to take a seat in front of one of six desktop computers, which were separated from each other by dividing walls. Then they were handed out a sheet with their personal identification key and asked to type in their identification key only after the experimenter had read aloud the instructions. The standardized instruction text assured the participants that there were no correct or incorrect answers, informed them that they were allowed to ask questions, reminded them to remain quiet after they had finished the questionnaire, and finally prompted them to type in their identification key and start filling out the questionnaire. After finishing the questionnaire, the participants were handed out a debriefing text and an envelope with 25.- Swiss Francs (resp. confirmation of participation), and they were asked to leave the lab quietly.

4.4.2 Individualized treatment

Items used for individualized treatment

The informational basis for the individual treatment consisted of the participants answers in questionnaire 1 concerning their travel behavior.

Travel behavior was assessed in identical sets of questions, which each referred to one specific journey undertaken in the years 2010 and 2011. The structure of the questionnaire allowed a maximum of five journeys per year for detailed examination.

First, participants were asked if they had traveled abroad in 2010 for a journey of at least two nights' stay. If they affirmed this question, they were asked to respond to a series of questions about their first journey in 2010. If the answer was no, then the participants were asked if they had undertaken a trip in 2011. If "yes," they had to start with the set of questions concerning their first journey in 2011, and if the answer was "no", the questions about the travel behavior were skipped.

The first question of each set asked the participant to name the country in which the travel destination was located. The country had to be chosen from a list of all countries in the world. Then the specific name of the destination was requested.

For the sake of easier calculation of traveled distances, participants were asked to assign the destination to one of seven predefined zones on a map of Europe and a map of the world (see Figures 11 and 12). The wording of this request was as follows:

Below you find a map of Europe and a world map. These we have divided in zones, which are defined by concentric circles. Please indicate in which zone your travel destination was located.

Subsequently, participants were asked to indicate their mode of transport for the journey to the destination (the list provided included train, car/motorcycle, coach, airplane, ship/ferry, bicycle, on foot, and combinations of different travel modes).

After questions on the duration of the trip to the destination (in hours), and the overall duration of the trip (in days), some questions about the trip were asked just for the sake of a coherent cover story (e.g., travel motives).

After every set of questions, participants were asked if they had undertaken another journey. If the answer was yes, then the same set of questions was asked for the next journey. Maximum five sets per year could be filled out. Of any additional journeys only the fact that a journey had been undertaken was recorded. Besides the information on the travel behavior, the treatment included the information that the participant had advocated pro-environmental in questionnaire 1. Although this information did not refer to real individual scores from questionnaire 1, items covering pro-environmental statements still had to be included in questionnaire 1. The following three items served this purpose.

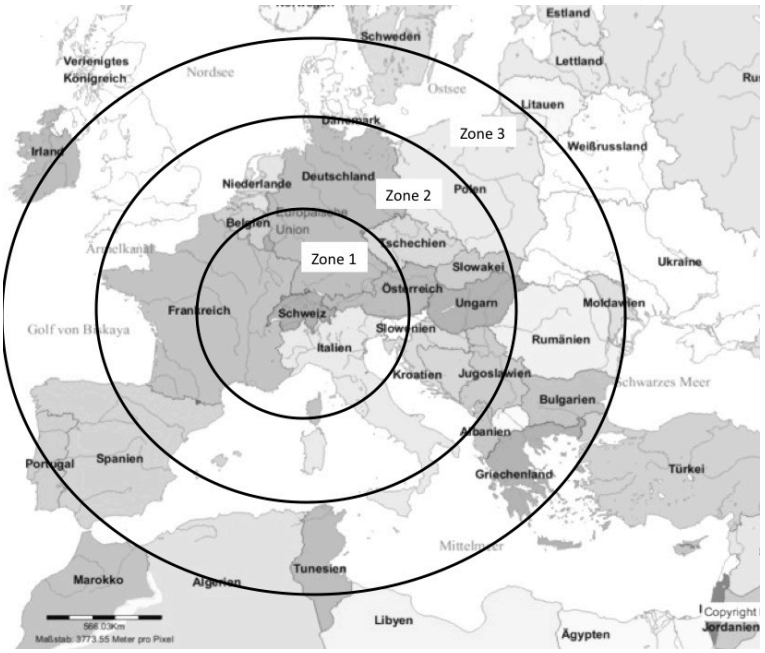

Figure 11: Map of Europe with concentric circles defining distance zones: Center = Switzerland, zone 1 = within 500 km distance, zone 2 = between 500 and 1,000 km, zone 3 = between 1,000 and 1,500 km

Are the following statements true (1, not true - 2, true)?

a) Generally, I behave in a way that has the least possible damaging effect on the environment.

b) I consider myself pro-environmental.

Do you agree with the following sentence?

a) Everybody should make an effort to protect our environment.

Treatment procedure

A random generator at the very end of questionnaire 1 assigned the participants to the control group or the experimental group (not visible to the participants). Both groups started questionnaire 2 with an introduction page, where in the first paragraph the participants were thanked for filling out the first questionnaire one week ago and later were requested to read the questions carefully while filling out the second questionnaire.

Between these two paragraphs the treatment text for the experimental group was placed, continuing on the subject of the first questionnaire. The first part of the treatment text was a standard text. It read:

Your answers corresponding to the questions on the environmental problems indicate that you are concerned about the natural environment and that being pro-environmental

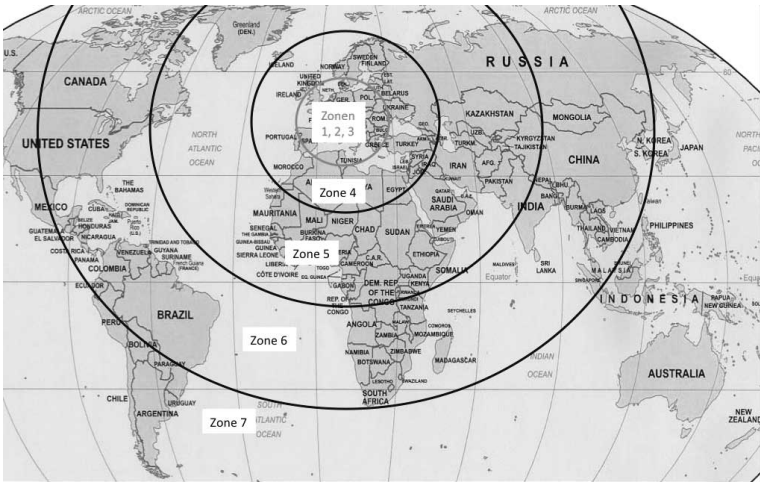

Figure 12: World map with concentric circles defining distance zones: Zone 1 to 3 = within 1,500 km distance, zone 4 = between 1,500 and 3,000 km, zone 5 = between 3,000 and 6,000 km, zone 6 = between 6,000 and 9,000 km, zone 7 = more than 9,000 km

goes for you without saying.[14]

Is this pro-environmental attitude also reflected in your travel behavior?

An individualized text followed. This text had been created in advance by the researcher according to individual information on past travel behavior that was retrieved from questionnaire 1. In most cases, the text provided a summary on the count of journeys made by airplane in the last two years, and the calculated distance that had been covered by these flights per year. Then the travel behavior was compared to the Swiss average travel behavior. For example:

In the years 2010 and 2011 you traveled by aircraft three times. On average you fly approximately 19,000 km per year. That is more than four times the Swiss average.

The objective of the treatment text was to make the participant aware of discrepancies between the above statement of being pro-environmental and her/his real travel behavior. To achieve this, the researcher tried to always pick that aspect out of the travel behavior that provided a possible contrast to the expressed pro-environmental attitude. If it was not possible to use the overall kilometers traveled per year by airplane as a contrast (because kilometers were less than the Swiss average of 4,500 km), other aspects had to be pointed at. In the case of a high number of short flights, this number was chosen. In some cases, the text highlighted the fact that the participant only traveled by plane and never by train,

[14]Unlike in the treatment procedure of Aronson et al. (1991) the participants plea for the moral behavior (pro-environmental behavior) was not addressed to a public. A public plea by participants would have put at risk the credibility of the cover story. However, as participants were informed about their pro-environmental attitudes by the research team, the research team acted as a substitute for a public addressee of the participants' plea. Therefore it has been assumed that participants perceived themselves as being committed to their pro-environmental attitudes.

or always by car and never by train. And in some cases it pointed out the short stay for which a flight was taken (e.g., shopping trip over the weekend to London).

The participants had been randomly assigned to the experimental or the control condition, and a treatment text was written for every participant in the experimental group, although some participants in the experimental group hardly provided aspects of travel behavior that were able to be contrasted with a pro-environmental attitude. For example, in one case the text was just: *In the years 2010 and 2011 you undertook one journey. For which you took the car, and not the train.* Three cases that had been randomly assigned to the experimental group were later assigned to the control group, because the participants had not reported a single journey in the years 2010 and 2011.

It was assumed that the level at which an individual judges his/her travel behavior as not pro-environmental varies in dependency on his/her general level of pro-environmental attitude. Therefore, it was assumed that it was still possible to induce feelings of hypocrisy even though a participant could only be made aware of modest travel behavior. At the same time, it may be the case that although a participant is made aware of very excessive travel behavior due to his/her low pro-environmental attitudes, he/she does not feel very hypocritical. However, the treatment text strived for the strongest possible hypocrisy inducement in any case. As the assignment to the experimental and control group was carried out randomly by a generator, and as the treatment text was made by a person other than the experimenter in the lab, the treatment can be considered double-blind.

4.4.3 Operationalization of variables

The operationalization of variables had to meet two general requirements:

1. The formulation of the items had to be as identical as possible to the items formulated for study I.

2. The items had to fit the context of travel behavior.

Greentech optimism (GTO) scale items

The GTO scale items were adopted from study I and complemented by items referring to 'greentech in transportation'. Two items each were formulated for the topics 'greentech in general', 'environmentally friendly power', 'energy-efficient home appliances', 'environmentally friendly public transport', 'environmentally friendly cars', and 'environmentally friendly aircraft technology'. The items were presented split in two sets, with a set of other questions between these two sets. Each set comprised one item on each topic. Set 1 comprised the following items:

Please indicate, to what extent the following statements are true (on a scale from 1 'never true' to 6 'always true'):

a) It makes me feel optimistic about our environment when I think of the developments being made in the field of green technologies.

b) I'm very optimistic about our environment, because the application of renewable energies (sun, wind, biogas, geothermal energy) is constantly being extended.

c) As more and more energy-efficient appliances for the household and for everyday life are getting on the market, I'm relaxed about our future.

d) It makes me feel optimistic about our environment when I see how the vehicle fleets of public transport are becoming increasingly environmentally friendly.

e) As our cars are becoming more and more increasingly environmentally friendly, I'm relaxed about our future.

f) I'm very optimistic about our environment as new developed airplanes use less and less fuel.

Set 2 comprised the following items:

a) Thanks to the constant development of green technologies our great-grandchildren will still live on a healthy Earth.

b) Thanks to the fostering of renewable energies (sun, wind, biogas, geothermal energy) our great-grandchildren will still live on a healthy Earth.

c) The environmental problem will become less important, because appliances for the household and for everyday life are becoming less and less energy consuming.

d) Because the vehicle fleets of public transport are becoming increasingly environmentally friendly, the environmental problem will become less and less important.

e) Environmental problems will decrease, as our cars use less and less fuel.

f) The environmental problem will become less important, because airplanes use less and less fuel.

Personal moral norm (PMN) items

The items for PMN could not be adopted from study I, as they refer directly to the chosen field of behavior. To capture feelings of moral obligation to travel in an environmentally friendly way, it was measured to what extent participants feel morally obliged to avoid air travel or travel by car and opt for train travel instead. Avoidance of long-haul flights was distinguished from avoidance of air travel, when traveling to destinations that are also reachable by train.

For feelings of moral obligation to avoid long-haul flights the following item was formulated:

Imagine that you are planning to go on vacation for two weeks in summer and that you are making considerations on possible destinations.

a) Do you have the feeling that "for the sake of the environment" you ought to choose a destination which can be reached without airplane? Please choose an answer on the following scale: (1 'not at all' to 6 'very strongly')

Feelings of moral obligation to choose to travel by train (for destinations reachable within 12 hours or less), was captured by the following items:

Imagine that you are planning to make a city trip over a long weekend to one of the cities listed below. Do you have the feeling that "for the sake of the environment" you ought to take the train? Please choose the respective answer for every city[15] *(1 'not at all' to 6 'very strongly'):*

a) ...when traveling to Vienna

b) ...when traveling to Rome

c) ...when traveling to Berlin

d) ...when traveling to Paris

e) ...when traveling to Barcelona

f) ...when traveling to Amsterdam

Behavioral measure

Pro-environmental behavior was measured by asking the participants at the very end of questionnaire 2 which of two lotteries they preferred to enter. In both lotteries the prize consisted of a travel voucher for 300.- Swiss francs (250.- euros); however, in lottery 1 it was a voucher for the Swiss Federal Railways (SBB) and in lottery 2 a voucher for Swiss International Airlines (Swiss).

If the railway lottery was chosen, behavior was coded as pro-environmental and if the airline lottery was chosen, behavior was coded as not pro-environmental. The item was formulated as follows:

Congratulations, you did it!

All participants will take part in a drawing for a travel voucher amounting to 300.- Swiss francs, either for the Swiss Federal Railways (SBB) or for Swiss International Airlines (Swiss).

[15] cities had been chosen which (in 2012) could be reached from Switzerland by train within 12 hours or less and to which flight connections existed too.

Please indicate in which of the two drawings you wish to be entered:

a) I want to take part in the drawing for the travel voucher for the Swiss Federal Railways (SBB).

b) I want to take part in the drawing for the travel voucher for Swiss International Airlines (Swiss).

To obtain information on the participants' reasons for their choices, they were asked to state their reasons for their choice in a free text field. From this information the dummy variable 'possession of travel card' was created, indicating if the participant named the possession of the 'Swiss general travel card'[16] or not.

Behavioral intention (IN)

Behavioral intention was also included in the questionnaire for the purpose of having a behavior proximal variable in case the behavioral measure was not reliable. Intention to travel in an environmentally friendly way was measured very similar to personal moral norm.

The *intention to avoid long-haul flights* was measured with the following item:

Imagine that you are planning to go on vacation for two weeks in summer and that you are making considerations on possible destinations. Will you choose a destination which can be reached without airplane? Please choose one of the following answers: (on the 6-point scale from 1 'on no account', 2 'no' to 5 'yes' and 6 'on any account')

For intention to choose the train (for journeys within 12 hours or less), the following items were formulated (cities: Vienna, Rome, Berlin, Paris, Barcelona, Amsterdam):

Imagine that you are planning to make a city trip over a long weekend to one of the below listed cities. Will you take the train for the journey? Please choose the respective answer for every city: (on the 6-point scale from 1 'on no account', 2 'no' to 5 'yes' and 6 'on any account')

Problem awareness (PA)

Items of *problem awareness* were formulated almost identical as in study I. Only the behavioral field had to be adapted to 'environmentally friendly travel':

Please indicate to what extent you agree with the following statements (from 1 'not at all' to 6 'fully'):

a) Air traffic contributes significantly to climate change.

b) The share of air traffic in climate change is being exaggerated by the media.

[16] In Switzerland a lot of persons, who travel regularly by train, buy the 'Swiss general travel card' which allows them to travel without extra costs on the entire Swiss public transport network.

Awareness of consequences (AC)

The items of awareness of consequences also had to be adapted to 'environmentally friendly travel':

Please indicate to what extent the following statements are true (1 'never true' to 6 'always true'):

a) If I often travel by airplane, this will have an impact on the environment.

b) Through modest travel behavior behavior I can contribute to environmental protection.

Manipulation check

To test if the dissonance treatment had an effect on feelings of dissonance, two constructs of dissonance were measured: feelings of guilt and feelings of hypocrisy. According to Aronson (1992) they represent different aspects of feelings of dissonance (see section 4.2). Besides their function as measures of the effectiveness of the treatment, these two constructs were expected to serve also as measured dissonance variables in the models.

A measurement of all items at both waves would have been desirable. However, the inclusion of dissonance items at wave one was seen as a potential risk to the credibility of the cover story. As a trade-off it was decided to include two dissonance items at wave one that did not carry statements about negative but rather about positive feelings. In addition, the focus of these two items was of general nature and not travel-specific (also in order to not put the cover story at risk). High values on these items indicate a good conscience, respectively a moral self in balance. Inverted, these items were expected to serve as a proxy for feelings of guilt.

While all items of feelings of hypocrisy were only measured at wave two, two items of feelings of guilt (FG_1 and FG_2) were measured at wave one and wave two, and two feelings of guilt items (FG_3 and FG_3) only at wave two. The following items measured (when inverted) *feelings of guilt* at wave one and two:

Please indicate, to what extent the following statements are true (from 1 'never true' to 6 'always true'):

a) With a clear conscience I can say that I do my share for environmental protection.

b) If everybody behaved as I do, our environment would be in a considerably better condition.

The following items measured feelings of guilt at wave two only:

a) I have a bad conscience about the environment, when I think of my travel behavior.

b) I have a bad feeling, when I think of how often I travel by airplane.

The following items measured feelings of hypocrisy (only at wave two):

a) Sometimes I have the feeling that I'm actually less pro-environmental than I pretend to be.

b) Sometimes I'm a bit uncertain about how pro-environmental I really am.

c) When I think about my travel behavior, I may not be as pro-environmental as I thought.

Control variables

Several control variables were measured: environmentalism (Dunlap, Van Liere, Merting, & Jones, 2000), reactance (Herzberg, 2002), conscientiousness (Borkenau & Ostendorf, 1993), social desirability (Stöber, 1999), external locus of control (Krampen, 1991).

4.4.4 Methods of statistical analysis

As in study I, structural equation modeling (SEM) was applied. SEM is a statistical analysis procedure that makes it possible to test the data fit of models formulated a priori (Bortz, 2005, p. 471). The procedure combines confirmatory factor analysis (CFA) and regression analysis. CFA serves to validate measurement of latent constructs, and regression analysis lends itself to estimating paths between the latent constructs. SEM allows also the quantification of indirect effects. SEM was carried out using Mplus (Version 6, Muthén & Muthén, 1998-2010).

For analyses that do not involve interaction effects, MPlus allows the selection of different procedures for the estimation of the regression paths (SEM) and the factor loadings (CFA). Beauducel and Herzberg (2006) recommended using weighted least squares means and variance adjusted (WLSMV) estimation instead of maximum likelihood (ML) estimation for models that include variables with two and three categories. Hence, for parameter estimations regarding models without interaction effects that included variables with two and three categories, WLSMV estimation was used. For interaction models ML was used.

To measure true intra-individual processes, a two-wave change model[17] was postulated and tested. Figure 13 shows the principle of the two-wave change model (from http://davidakenny.net/cm/ar.htm).

The two-wave change model refers to a model by Raykov (1992), who named it "structural model for estimating total true change correlations with studied correlates and predictors of change": "The model ... parametrises the covariance between total ... true change in a repeatedly assessed psychological construct, with ... correlates of that change occurring between two assessments." (p. 104)

[17] http://davidakenny.net/cm/ar.htm

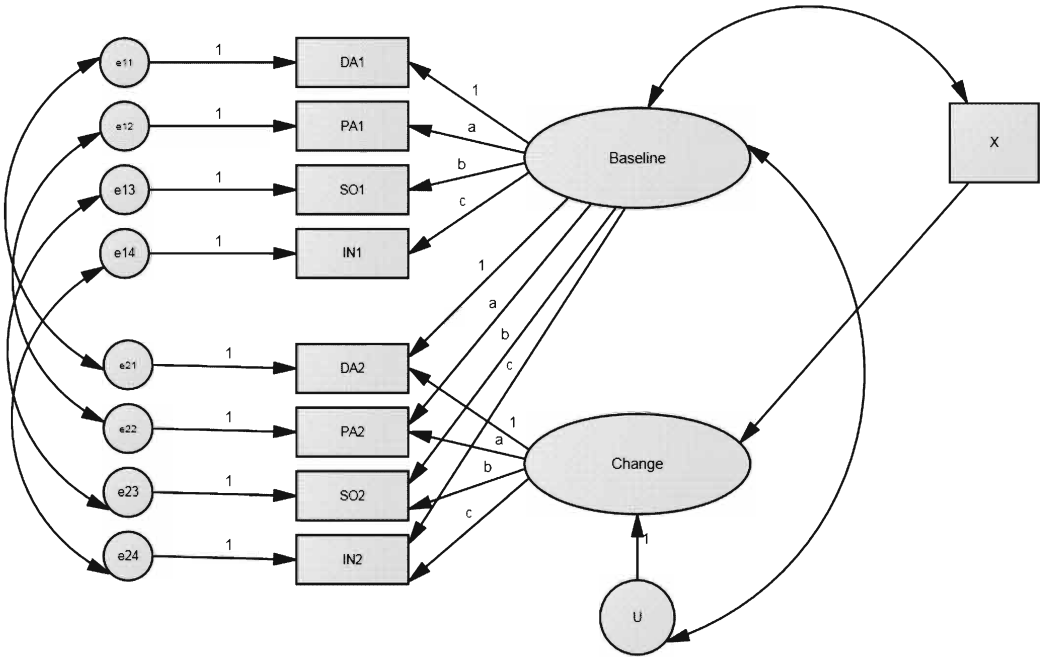

Figure 13: Principle of two-wave change model (from: http://davidakenny.net/cm/ar.htm)

The model consists of the two latent factors 'baseline' and 'change'. Both refer to the dependent variable of interest (e.g., personal moral norm). However, 'baseline' represents the dependent variable at wave 1, and 'change' represents the change in the dependent variable between wave 1 and wave 2.

The basic principle is that whereas the manifest variables from both wave 1 and wave 2 load on the latent factor 'baseline', only the manifest variables from wave 2 load on the latent factor 'change'.

The loadings of the same measure from different waves are set equal (e.g., all loadings of the measure PA (see Figure 13) to either 'baseline' and 'change' have the value of the unknown constant a). And, all the loadings of the first measure (from wave 1 and wave 2) are constrained to 1. Additionally, errors of the same measure are correlated over time.

The independent variable x (which can also consist of a latent construct) is related via a regression path to the factor 'change'. X represents a 'predictor of change' and the weight of the regression path from x to the factor 'change' represents the strength of the 'predictor of change'.

The double-headed arrow between the factor 'baseline' and the factor 'change' parametrizes the dependence of change from the initial level, while the double-headed arrow between x and baseline describes the dependence between x and the initial level of the dependent variable.

4.5 Results

4.5.1 Description of the sample

190 participants filled out questionnaire 1. Of the 190, 169 (88.95%, drop-out = 11.05%) took part in the second part of the study at the Department of Psychology. Tables 9 and 10 show the sample statistics for these 169 participants.

Of the participants 72.8% were women; the mean age was 26.2 years (SD = 8.7). University students made up 60.9% of the participants, and 93.5% of the participants indicated high school, technical college, or university as their highest level of completed education.

Table 9:
Sample statistics I: Sex and age (N = 169)

	%
Sex	
Female	72.8
Male	27.2
Age*	
18-25	68.0
26-35	23.1
36-45	3.6
46-55	4.1
56-65	0
65+	1.2

Note. *M = 26.2, SD = 8.7

Table 10:
Sample statistics II: Employment status, education (N = 169)

	%
Employment status	
Student	60.9
Employee	33.7
Unemployed	3.6
Retired	1.2
Other	0.6
Highest education	
Elementary School	2.4
Apprenticeship	4.1
High school	59.2
Technical college	2.4
University	31.9

4.5.2 Descriptives and distribution of the GTO scale

As can be seen in Appendix B.1, at wave 1 standardized factor loadings of the GTO scale items ranged from $\beta = 0.214$ (GTO_1) to $\beta = 0.858$ (GTO_{12}), the item means showed values between 2.27 (GTO_{12}) and 4.17 (GTO_1), and the standard deviations of the items ranged from 0.964 (GTO_6) to 1.102 (GTO_9). The CFA revealed the following fit indices: χ^2 (54) = 350.485, p = 0.000, RMSEA = 0.180, CFI = 0.706, TLI = 0.641.

At wave 2 (see Appendix B.2) standardized factor loadings of the GTO scale items ranged from $\beta = 0.363$ (GTO_1) to $\beta = 0.856$ (GTO_10) and the item means had values between 2.36 (GTO_{12}) and 3.82 (GTO_1). Standard deviations of the items ranged from 0.975 (GTO_6) to 1.106 (GTO_7). The CFA led to the following fit indices: (χ^2 (54) = 292.486, p = 0.000, RMSEA = 0.162, CFI = 0.753, TLI = 0.698).

The GTO scale items at both waves were presented split into two lists with other variables being presented between the two lists. First, the GTO scale items with the uneven numbers were presented and later the GTO scale items with even numbers. Each two consecutively numbered items (eg., GTO_1 and GTO_2) covered the same topic, although with variations in wording. The CFAs for GTO at wave 1 and wave 2 revealed that in both questionnaires the evenly numbered GTO scale items show more consistent factor loadings (see Appendices B.1 and B.2). Therefore, it was decided to use only those items for further examinations.

Additionally, although they showed acceptable factor loadings, it was decided to exclude items related to public transport, as public transport per se is associated with sustainability, regardless of whether efficiency improvements are made or not. This could have potentially led to confusion. Finally, a short scale, consisting of five items, was used for the analyses.

At wave one, the shortened GTO scale showed the following model fit: χ^2 (4) = 16.373, p = 0.0026, RMSEA = 0.135, CFI = 0.963, TLI = 0.909. Cronbach's α of the scale was 0.871. The error terms of the items GTO_2 and GTO_4 were allowed to intercorrelate. The standardized β of this intercorrelation was 0.729. Table 11 shows the standardized factor loadings of the shortened GTO scale at wave one.

Table 11:
Standardized factor loadings of the items of greentech optimism (short scale) at wave 1 (N = 169)

Items per scale		β
Greentech optimism (6-point Likert scale)		
GTO_2	Thanks to the constant development of green technologies our great-grandchildren will still live on a healthy Earth.	.502
GTO_4	Thanks to the fostering of renewable energies (sun, wind, biogas, geothermal energy) our great-grandchildren will still live on a healthy Earth.	.504
GTO_6	The environmental problem will become less important, because appliances for the household and for everyday life are becoming less and less energy consuming.	.797
GTO_{10}	Environmental problems will decrease, as our cars use less and less fuel.	.908
GTO_{12}	The environmental problem will become less important, because airplanes use less and less fuel.	.910

At wave two, the shortened GTO scale showed the following model fit: χ^2 (4) = 13.443, p = 0.0093, RMSEA = 0.118, CFI = 0.965, TLI = 0.913). Cronbach's α was 0.847 and the intercorrelation between GTO_2 and GTO_4 was β = 0.656. Table 12 shows

the factor loadings of the shortened GTO scale at wave two.

Table 12: Standardized factor loadings of the items of greentech optimism (short scale) at wave 2 (N = 169)

Items per scale		β
Greentech optimism (6-point Likert scale)		
GTO_2	Thanks to the constant development of green technologies our great-grandchildren will still live on a healthy Earth.	.494
GTO_4	Thanks to the fostering of renewable energies (sun, wind, biogas, geothermal energy) our great-grandchildren will still live on a healthy Earth.	.560
GTO_6	The environmental problem will become less important, because appliances for the household and for everyday life are becoming less and less energy consuming.	.746
GTO_{10}	Environmental problems will decrease, as our cars use less and less fuel.	.938
GTO_{12}	The environmental problem will become less important, because airplanes use less and less fuel.	.883

As in study I, the GTO scale was visually tested for normal distribution. Figures 14 and 16 show the distribution of the GTO scale (mean scores of items) for wave 1 and wave 2, and Figures 15 and 17 the respective Q-Q plots.

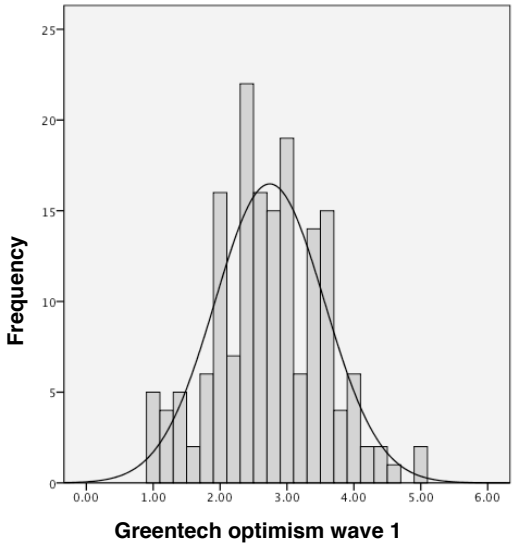

Figure 14: Distribution of greentech optimism wave 1 (mean scores of items); N = 169, M = 2.74, SD = 0.818

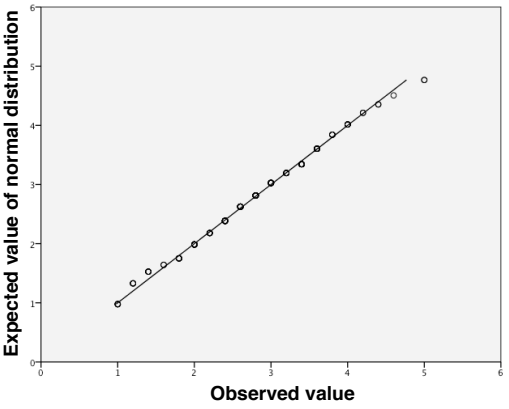

Figure 15: Q-Q plot of greentech optimism wave 1 (mean scores of items); N = 169

Test-retest-reliability of the GTO scale was estimated by regressing the latent GTO construct at wave 2 on the latent GTO construct at wave 1. This was carried out separately

for the treatment and the control group. The standardized regression weight between the GTO scales of wave 1 and 2 was β = to 0.723 (2-tailed p = 0.000) for the treatment group (N = 79) and β = 0.807 (2-tailed p = 0.000) for the control group (N = 90).

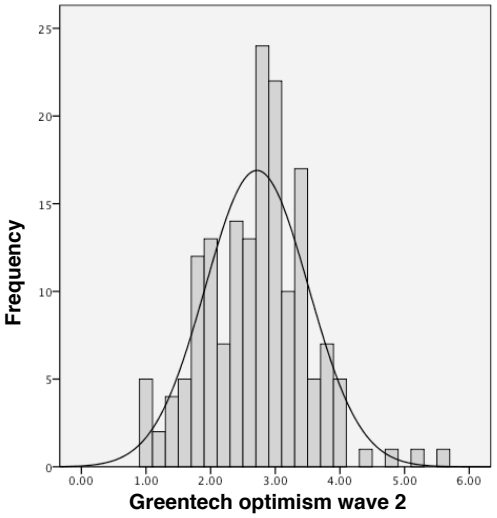

Figure 16: Distribution of greentech optimism wave 2 (mean scores of items); N = 169, M = 2.72, SD = 0.798

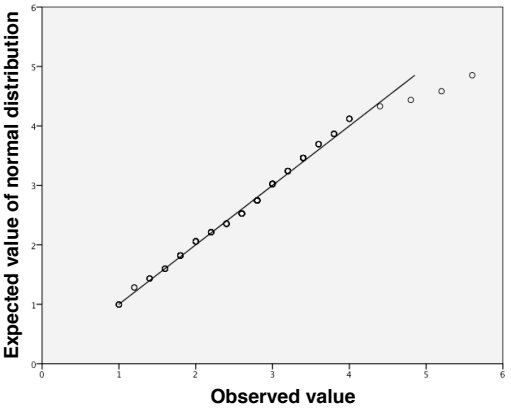

Figure 17: Q-Q plot of greentech optimism wave 2 (mean scores of items); N = 169

4.5.3 Descriptives of model constructs

Personal moral norm

At wave 1 (see Appendix B.3) standardized factor loadings of the PMN items ranged from β = 0.578 (PMN_1) to β = 0.888 (PMN_4), and the item means had values between 2.66 (PMN_1) and 4.38 (PMN_5). Standard deviations of the items ranged from 1.393 (PMN_1) to 1.624 (PMN_3). The CFA revealed the following fit indices: χ^2 (14) = 49.773, p = 0.000, RMSEA = 0.123, CFI = 0.930, TLI = 0.895.

In Appendix B.4 it can be seen that at wave 2 standardized factor loadings of the PMN items ranged from β = 0.681 (PMN_5) to β = 0.839 (PMN_3) and the item means from 2.70 (PMN_6) to 4.54 (PMN_5). Standard deviations of the items showed values from 1.347 (PMN_1) to 1.555 (PMN_3). The fit indices were: χ^2 (14) = 47.646, p = 0.000, RMSEA = 0.119, CFI = 0.945, TLI = 0.917.

To get a more parsimonious construct, and to give the item PMN_1 (long-haul flights) more weight, the two items from PMN_2 to PMN_7 with the smallest factor loading (PMN_5 and PMN_6) were removed from the scale at both waves.

At wave one, the shortened PMN scale showed the following model fit: (χ^2 (5) = 6.235, p = 0.2840, RMSEA = 0.038, CFI = 0.996, TLI = 0.992). Cronbach's α was 0.893. Table 13 shows the factor loadings of the shortened PMN scale at wave one.

Table 13:
Standardized factor loadings of the items of personal moral norm (short scale) at wave 1 (N = 169)

Items per scale		β
Personal moral norm		
PMN_1	Feelings of moral obligation to avoid long-haul flights on summer holidays.	.572
PMN_2	Feelings of moral obligation to choose to travel by train, when travelling to Vienna.	.849
PMN_3	Feelings of moral obligation to choose to travel by train, when travelling to Rome.	.853
PMN_4	Feelings of moral obligation to choose to travel by train, when travelling to Berlin.	.886
PMN_7	Feelings of moral obligation to choose to travel by train, when travelling to Amsterdam.	.785

At wave two, the shortened PMN scale showed the following model fit: (χ^2 (5) = 16.448, p = 0.0057, RMSEA = 0.116, CFI = 0.970, TLI = 0.939). Cronbach's α was 0.908. Table 14 shows the factor loadings of the shortened PMN scale at wave two.

Table 14:
Standardized factor loadings of the items of personal moral norm (short scale) at wave 2 (N = 169)

Items per scale		β
Personal moral norm		
PMN_1	Feelings of moral obligation to avoid long-haul flights on summer holidays.	.757
PMN_2	Feelings of moral obligation to choose to travel by train, when travelling to Vienna.	.852
PMN_3	Feelings of moral obligation to choose to travel by train, when travelling to Rome.	.830
PMN_4	Feelings of moral obligation to choose to travel by train, when travelling to Berlin.	.838
PMN_7	Feelings of moral obligation to choose to travel by train, when travelling to Amsterdam.	.794

Problem awareness and awareness of consequences

As these two constructs each only comprise two items, CFA cannot be applied. Therefore, no factor loadings and no fit indices are reported. Instead, the standardized regression weights β between the two items of a construct are reported.

At wave 1 the standardized regression weight between problem awareness items PA_1 and PA_2 was $\beta = 0.546$, and the item means were 3.14 (PA_2), respectively 3.90 (PA_1). Standard deviations of the items were 1.029 (PA_2) and 1.067 (PA_1).

The standardized regression weight between awareness of consequences items AC_1 and AC_2 was $\beta = 0.661$, and the item means were 4.15 (AC_2), respectively 4.22 (AC_1). Standard deviations of the items were 1.169 (AC_1) and 1.173 (AC_2). (see Table 15)

Table 15:
Items of problem awareness and awareness of consequences at wave 1 including their means (*M*), standard deviations (*SD*) and standardized factor loadings (β) (*N* = 169)

Items per scale		*M* (*SD*)	β
Problem awareness (6-point Likert scale)			
PA_1	Air traffic does significantly contribute to climate change.	3.90 (1.067)	1
PA_2	The share of air traffic in climate change is being exaggerated by the media (recoded).	3.14 (1.029)	.546
Awareness of consequences (6-point Likert scale)			
AC_1	If I often travel with the airplane, this will have an impact on the environment.	4.22 (1.169)	1
AC_2	Through modest travel behavior behavior I can contribute to environmental protection .	4.15 (1.173)	.661

At wave 2 standardized regression weight between problem awareness items PA_1 and PA_2 was $\beta = 0.688$, and the item means were 3.01 (PA_2), respectively 4.20 (PA_1). Standard deviations of the items were 1.032 (PA_2) and 1.033 (PA_1).

The standardized regression weight between awareness of consequences items AC_1 and AC_2 was $\beta = 0.668$, and the item means were 4.25 (AC_2), respectively 4.30 (AC_1). Standard deviations of the items were 1.062 (AC_2) and 1.068 (AC_1). (cf. 16).

Table 16:
Items of problem awareness and awareness of consequences at wave 2 including their means (*M*), standard deviations (*SD*) and standardized factor loadings (β) (*N* = 169)

Items per scale		*M* (*SD*)	β
Problem awareness (6-point Likert scale)			
PA_1	Air traffic contributes significantly to climate change.	4.20 (1.033)	1
PA_2	The share of air traffic in climate change is being exaggerated by the media. (recoded).	3.01 (1.032)	.688
Awareness of consequences (6-point Likert scale)			
AC_1	If I often travel by airplane, this will have an impact on the environment.	4.30 (1.068)	1
AC_2	Through modest travel behavior behavior I can contribute to environmental protection.	4.25 (1.062)	.668

Feelings of guilt 'proxy' (not travel-specific)

At wave 1 standardized regression weight between feelings of guilt 'proxy' items FG_1 and FG_2 was $\beta = 0.660$, and the item means were 3.87 (FG_2) and 4.01 (FG_1). Standard deviations of the items were 0.876 (FG_1) and 0.955 (FG_2). The standardized regression weight between feelings of guilt 'Proxy' items FG_1 and FG_2 was $\beta = 0.703$, and the item means were 3.86 (FG_2) and 3.95 (FG_1). Standard deviations of the items were 0.953 (FG_1) and 0.976 (FG_2). (see Appendix B.5)

Feelings of guilt (travel-specific)

At wave 2 standardized regression weight between feelings of guilt items FG_3 and FG_4 was $\beta = 0.789$, and the item means were 2.76 (FG_4) and 2.96 (FG_3). Standard deviations of the items were 1.244 (FG_3) and 1.278 (FG_4). (see Appendix B.5)

Feelings of hypocrisy

Standardized factor loadings of the feelings of hypocrisy items (only wave 2) ranged from $\beta = 0.416$ (FH_3) to $\beta = 0.819$ (FH_1) and the item means from 3.17 (FH_1) to 3.72 (FH_3). Standard deviations of the items ranged from 1.062 (FH_1) to 1.263 (FH_3). As the measurement model was just identified with three items, no fit indices were reported by MPlus. (see Appendix B.5)

Behavioral measure

The behavioral measure, which consisted in the preference for either the railway lottery or the airline lottery, was distributed as follows among the participants: 50.9% chose the railway lottery, and 49.1% chose the airline lottery.

4.5.4 Manipulation check

With feelings of guilt and feelings of hypocrisy two constructs of dissonance were measured. Whereas all items of feelings of hypocrisy were measured only at wave two, two items of feelings of guilt (FG_1 and FG_2) were measured at wave one and wave two, and two items (FG_3 and FG_3) only at wave two.

Hence, a manipulation check for the influence of the treatment on feelings of hypocrisy and on FG_3 and FG_3 could only be carried out between subjects. However, the influence of the treatment on FG_1 and FG_2 could also be tested within subjects (two-wave change model).

Table 17 shows the effect of the treatment on different aspects of feelings of dissonance. The table generally distinguishes between effects 'between subjects' and 'within subjects'. Additionally, among the effects 'between subjects' effects on 'travel specific'

dissonance feelings are reported separately from 'general' dissonance feelings (for both feelings of guilt (FG) and feelings of hypocrisy (FH)).

As first tests revealed manipulation effects between β = -0.107 (p = 0.326) and β = 0.047 (0.273) (see column three in table 17), it was decided to test also with samples that excluded participants who did not report at least one flight (column four, N = 142). These exclusions tended to result in stronger treatment effects, although significant effects were still not reached.

If the 'between subjects' section in Table 17 is examined in detail, it stands out, that treatment effects on both feelings of guilt (FG) and feelings of hypocrisy (FH) were in trend more in line with the hypothesis, when they were travel specific (FG_3, FG_4; FH_3) than when they were of a general nature (FG_1, FG_2; FH_1, FH_2). In these cases the treatment even tended to result in a decrease of guilt/hypocrisy feelings. This trend to negative treatment effects may be due to the first part of the treatment text, which included the 'information' that the participant had advocated pro-environmental in questionnaire 1 (see section 4.4.2).

In the 'within subjects' section, Table 17 shows the only 'within subjects' manipulation check (FG General: FG_1, FG_2).

Table 17:
Effect of treatment on feelings of guilt and on feelings of hypocrisy, for the total sample and for participants who reported at least 1 flight journey within the last two years

Dissonance Measure		Items	β (2-tailed p)*	β (2-tailed p)**
Between subjects				
FG	Travel specific	FG_3, FG_4	0.002 (0.976)	0.061 (0.470)
FG	General	FG_1, FG_2	-0.033 (0.669)	0.000 (0.998)
FH	Travel specific	FH_3	0.047 (0.546)	0.097 (0.242)
FH	General	FH_1, FH_2	-0.090 (0.239)	-0.176 (0.313)
Within subjects				
FG	General	FG_1, FG_2	-0.107 (0.326)	-0.065 (0.633)

Note. *total sample (N = 169); **participants who reported at least 1 flight journey within the last two years (N = 142)

It can be concluded that the tests of treatment effects on general and travel specific measures of FG and FH did not reveal significant treatment effects. In the case of the general measures of FG and FH the trend of the treatment effects appeared to be the opposite of the expected trend. These (in trend) negative treatment effects may be due to the fact that the first part of the treatment text assigned to the participants positive general environmental attitudes. This may have relieved the participants of the treatment group concerning their general FG towards the environment. However, the travel specific

measures of FG and FH, although there were no significant effects, tended to be influenced by the treatment in the (intended) positive direction. It appears that the second part of the treatment, making the participants individual travel behavior salient, originated these positive treatment effects.

As a consequence of the inconsistent and non-significant effects of the treatment, modeling with the treatment variable as factor or moderator cannot be expected to lead to results consistent with the hypotheses. Instead, it seems more promising to use the measured feelings of dissonance. It was decided to use the travel specific FG (FG_3, FG_4) as the measured dissonance variable, as they focus more clearly on negative feelings than the hypocrisy items, which are formulated in a more neutral and less affective way. It is conceivable that participants can score high on the FH measure (as they are aware of inconsistencies between their pro-environmental statement and their travel behavior) without necessarily perceiving this inconsistencies as affectively negative. However, if the travel-specific FG are regressed on travel-specific FH, the respective regression weight was $\beta = 0.645$ ($p = 0.000$). Hence, it appears, that while FG and FH are not equivalent dissonance measures, they share a considerable amount of variance.

Table 18:
Overview of the models tested in sections 4.5.5 to 4.5.8

Name and description of model
Section 4.5.5: GTO as indirect factor of PMN and pro-environment. behavior
Model 1a: GTO as factor of pro-environment. behavior, mediated by PA, AC, PMN
Model 1b: GTO as factor of pro-environment. behavior, mediated by PMN
Model 1cT: Treatment as moderator of the GTO - PMN relationship
Model 1cFG: FG as moderator of the GTO - PMN relationship
Model 1dFG: FG as moderator of the GTO - behavior relationship
Section 4.5.6: GTO as moderator of the FG - PMN relationship
Model 2T: GTO as moderator of the treatment - PMN relationship
Model 2FG: GTO as moderator of the FG - PMN relationship
Section 4.5.7: GTO as moderator of the PMN - behavior relationship
Model 3: GTO as moderator of the PMN - behavior relationship
Section 4.5.8: GTO as moderator of the FG - behavior relationship
Model 4: GTO as moderator of the FG - behavior relationship

In the following sections the results of the structural equation modeling are reported. Section 4.5.5 presents the structural parameters of five models comprising GTO as indirect negative factor of PMN and pro-environmental behavior (Models 1a, 1b, 1cT, 1cFG, and 1dFG), followed by section 4.5.6 that shows two models comprising GTO as a negative moderator of the relationship between feelings of dissonance and PMN (Models 2T

and 2FG). Section 4.5.7 then presents a model comprising GTO as a negative moderator of the relationship between PMN and pro-environmental behavior (Model 3). Finally, section 4.5.8 presents one model comprising GTO as negative moderator of the relationship between feelings of dissonance and pro-environmental behavior (Model 4). Table 18 provides an overview of the models tested in sections 4.5.5 to 4.5.8.

4.5.5 SEM results 1: GTO as factor of pro-environmental behavior

In this first section of SEM results, five model tests are reported. The first model (model 1a) represents the original process model from study I, which was extended by a behavioral measure and a covariate. Model 1b, a shortened version of model 1a, is presented subsequently. Finally, models that incorporate tests of the hypothesized moderating role of dissonance are presented (models 1cT, 1cFG, 1dFG).

Model 1a: GTO as negative factor of travel, mediated by PA, AC, and PMN (complete factor model)

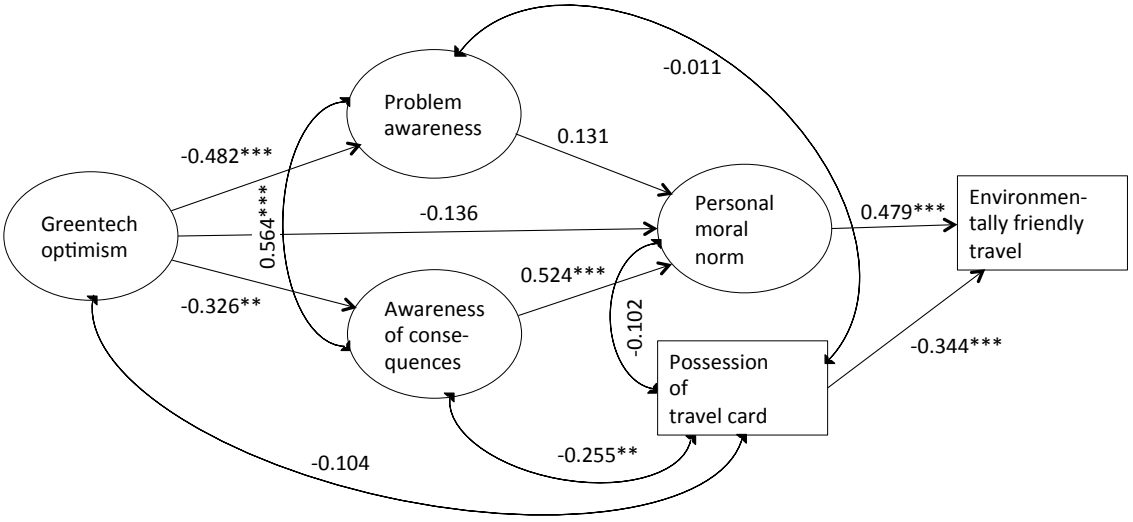

Figure 18: Standardized structural parameters of the complete factor model (model 1a) at wave 2 (SEM, WLSMV Estimator; missings listwise, N = 169; error terms of GTO_2 and GTO_4 freely intercorrelated)

To test hypotheses H2 to H6[18], the original process model from study I (see figure 3) was first extended by the dependent variable 'environmentally friendly travel', and the

[18] H2: GTO has a negative influence on the personal moral norm (feeling of personal responsibility to show environmentally responsible behavior); H3: The negative influence of GTO on the personal moral norm is mediated by problem awareness; H4: The negative influence of GTO on the personal moral norm is mediated by awareness of consequences; H5: Personal moral norm has a positive influence on pro-environmental behavior; H6: GTO has an indirect negative influence on pro-environmental behavior, via personal moral norm.

covariate 'possession of travel card'. Then it was tested with the data from wave 2 (MPlus Version 6, WLSMV estimator).

The model as displayed in Figure 18 shows the following fit indices values: χ^2 (93) = 109.438, p = 0.1172, RMSEA = 0.032, CFI = 0.965, TLI = 0.955.

The following weights were observed for the regression paths: The path from green-tech optimism (GTO) to problem awareness (PA) had a standardized regression weight of β = -0.482 (p = 0.000), and the path from GTO to awareness of consequences (AC) was β = -0.326 (p = 0.000). There was also a direct effect from GTO to personal moral norm (PMN) of β = -0.136 (p = 0.072). The standardized regression weight of the path from problem awareness (PA) to personal moral norm (PMN) was β = 0.131 (p = 0.250) and from awareness of consequences (AC) to personal moral norm (PMN) β = 0.524 (p = 0.000). PMN had an effect of β = 0.479 (0.000) on environmentally friendly travel, and the covariate 'possession of travel card' had an effect of β = -0.344 (p = 0.000). The intercorrelation between PA and AC was β = 0.564 (p = 0.000), and the intercorrelations of the model constructs with the covariate 'possession of travel card' were as follows: with GTO β = -0.104 (p = 0.225), with AC β = -0.225 (p = 0.003), with PA β = -0.011 (p = 0.915), and with PMN β = -0.102 (p = 0.311). The intercorrelation between the error terms of GTO_2 and GTO_4 was β = 0.633 (p = 0.000).

Table 19 shows the total effects and indirect effects of GTO on PMN and environmentally friendly travel.

Table 19:
Standardized direct, indirect, specific indirect and total effects of GTO on PMN and environmentally friendly travel

	β	2-tailed p
GTO on PMN		
Total effect	-0.370	0.000
Direct effect	-0.136	0.072
Indirect effect via PA and AC	-0.234	0.000
Indirect effect via PA	-0.063	0.251
Indirect effect via AC	-0.171	0.001
GTO on environmental-friendly travelling		
Indirect effect via PA, AC, PMN	-0.177	0.000
Indirect effect via PA and PMN	-0.030	0.255
Indirect effect via AC and PMN	-0.082	0.004
Indirect effect via PMN	-0.065	0.098

The explained variance was R^2 = 0.460 (p = 0.000) for PMN, and R^2 = 0.402 (p = 0.000) for environmentally friendly travel. GTO accounted for 3.1% of explained variance in environmentally friendly travel and for 13.7% in PMN.

Model 1b: GTO as negative factor of environmentally friendly travel behavior, mediated by PMN (short factor model)

Although the actual model showed good indices for model fit, the sample size of N = 169 was critical for a model with 16 variables and 58 free parameters. Rules of thumb[19] suggest a minimum of 15 observations per observed variable and five observations per free parameter. In the present model the ratio observations per observed variable was $N = \frac{169}{16} = 10.56$ and the ratio of observations per free parameter was $N = \frac{169}{58} = 2.91$.

A short version of the complete factor model with more adequate observations per estimated parameter ratios will therefore be presented in this section. This model omitted the mediators problem awareness (PA) and awareness of consequences (AC). The short model (see Figure 19) consisted of 12 observed variables and 39 free parameters. The ratio of observations per free parameter was $N = \frac{169}{39} = 4.33$, and the ratio of observations per observed variable was $N = \frac{169}{12} = 14.08$.

The model fit of the short model was as follows: χ^2 (50) = 44.868, p = 0.6789, RMSEA = 0.000, CFI = 1.000, TLI = 1.021, WRMR = 0.390.

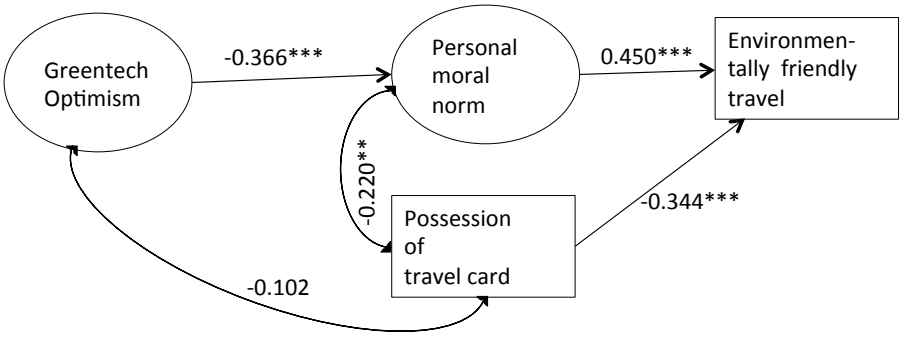

Figure 19: Standardized structural parameters of the short factor model (Model 1b) at wave 2 (SEM, WLSMV estimator; missings listwise, N = 169; error terms of GTO_2 and GTO_4 freely intercorrelated)

The path from GTO to PMN had a regression weight of β = -0.366 (p = 0.000), and the path from PMN to environmentally friendly travel was β = 0.450 (p = 0.000). Possession of travel card had an effect on environmentally friendly travel of β = -0.344 (p = 0.000). The intercorrelations of 'possession of travel card' were of β = -0.102 (p = 0.234) with GTO and of β = -0.220 (p = 0.016) with PMN. And, the intercorrelation between the error terms of GTO_2 and GTO_4 was β = 0.639 (p = 0.000). The indirect effect of GTO on environmentally friendly travel was β = -0.177 (p = 0.001).

The explained variance was R^2 = 0.134 (p = 0.012) for PMN, and R^2 = 0.373 (p = 0.000) for environmentally friendly travel. GTO accounted for 2.7% of explained variance

[19]Ghisletta, 2012, Course University of Zurich

in environmentally friendly travel and for 13.4% in PMN.

Models 1cT and 1cFG: Dependence of negative GTO - PMN relationship on level of dissonance

To test hypothesis H7, according to which the negative influence of GTO on PMN is moderated by cognitive dissonance, again the data from wave two was applied. Model 1c was first tested with the treatment variable as moderator, and then with the measured FG variable.

As the manipulation check indicated, that the treatment may not have resulted in the intended effect (induction of feelings of dissonance), in the following any results comprising the treatment variable have to be considered with caution.

Figure 20 shows unstandardized[20] regressions weights of the moderator model 1cT. The unstandardized regression weight of the path from GTO to PMN was B = -0.438 (p = 0.000), and of the path from the treatment variable B = 0.183 (p = 0.357). The unstandardized regression weight of the interaction term Treatment x GTO was B = 0.048 (p = 0.817). The unstandardized regression weight of the intercorrelation between the error terms of GTO_2 and GTO_4 was 0.516 (p = 0.000), and the intercorrelation between GTO and treatment was B = 0.065 (0.103).

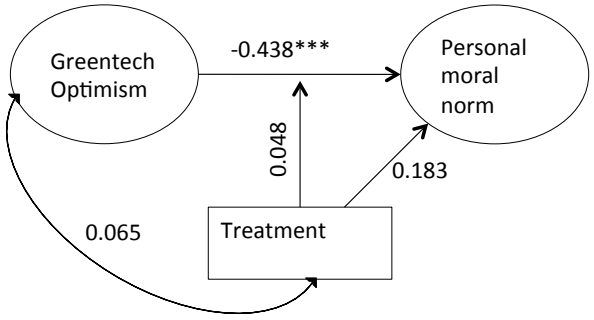

Figure 20: Unstandardized structural parameters of the moderator model 1cT at wave 2. Treatment as moderator of the GTO - PMN relationship (SEM, type = random; missings listwise, N = 169; error terms of GTO_2 and GTO_4 freely intercorrelated)

As the manipulation check (see section 4.5.4) indicated that the treatment appeared to have had a stronger effect on participants who reported at least one flight within the years 2010 and 2011 (N = 142), in the following all analyses comprising the treatment variable are reported also for the above mentioned sample of N = 142. For this sample the unstandardized regression weights were as follows: PMN on GTO B = -0.438 (0.000),

[20]For moderator analyses MPlus doesn't provide fit indices, and reports only unstandardized parameters. The reporting of unstandardized B values is as well recommended by Whisman and McClelland (2005)

PMN on treatment variable $B = 0.218$ ($p = 0.326$), PMN on treatment x GTO = 0.112 ($p = 0.628$).

Model 1c was subsequently tested with FG as a moderator instead of the treatment variable (see figure 21).

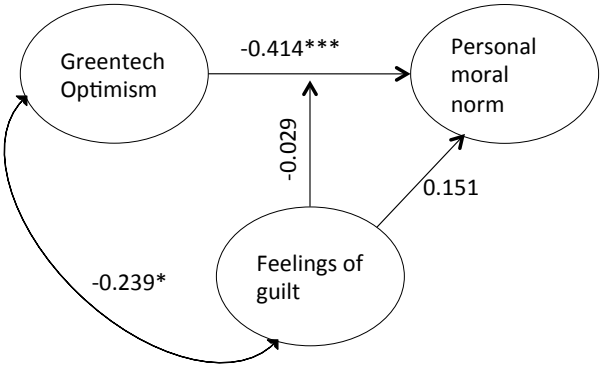

Figure 21: Unstandardized structural parameters of the moderator model 1cFG at wave 2. Feelings of guilt (FG) as moderator of the GTO - PMN relationship (SEM, type = random; missings listwise, $N = 169$; error terms of GTO_2 and GTO_4 freely intercorrelated)

The following parameter estimates were observed: The unstandardized regression weight of the path from GTO to PMN was $B = -0.414$ ($p = 0.000$), and of the path from FG to PMN was $B = 0.151$ ($p = 0.132$). The unstandardized regression weight of the interaction term FG x GTO was $B = -0.029$ ($p = 0.762$). The unstandardized regression weight of the intercorrelation between the error terms of GTO_2 and GTO_4 was 0.502 ($p = 0.000$), whereas the intercorrelation between GTO and FG was $B = -0.239$ (0.015).

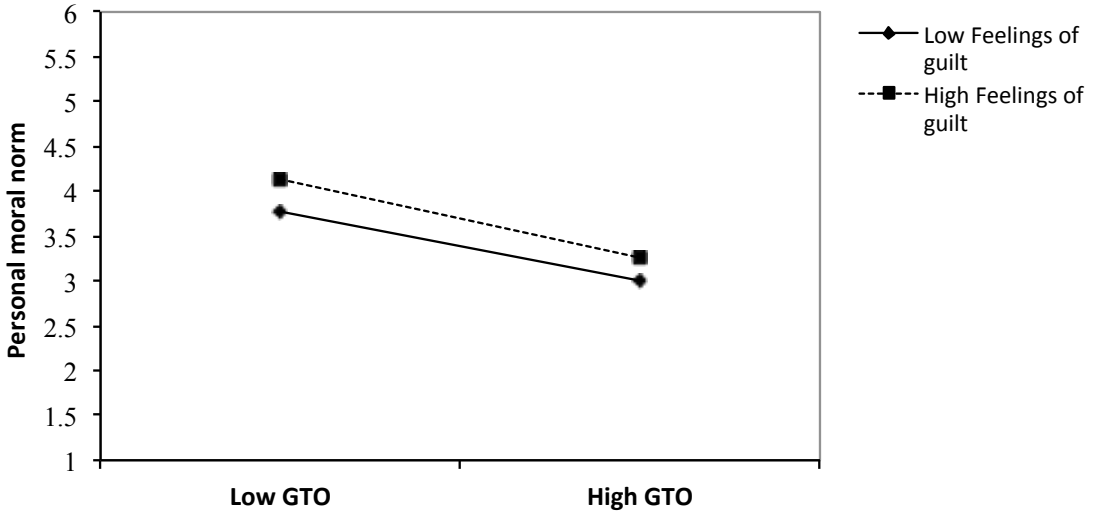

Figure 22: Interaction plot: Regression predicting personal moral norm for low (-1 *SD*) vs. high (+ 1 *SD*) feelings of guilt.

This model is equivalent to the moderator model of study I displayed in Figure 9. The interaction plot (see Figure 22) shows, that both slopes for low and high feelings of guilt are negative and almost identical. They differ only in their intercepts, which are higher for high FG.

Model 1dFG: Dependence of negative GTO - behavior relationship on level of dissonance

Hypothesis H8, which postulates, that the negative influence of GTO on pro-environmental behavior is negatively moderated by feelings of dissonance, was tested as follows: As in model 1cT no negative interaction of the treatment variable and GTO on PMN had been observed, a negative interaction effect of GTO and the treatment variable on environmentally friendly travel was not expected. The analysis was therefore omitted. However, although it was not significant, the interaction of FG and GTO on PMN was negative (*B* FG x GTO = -0.029, p = 0.762). Thus, the next analysis presented below is the relationship between GTO and environmentally friendly travel moderated by FG (see Figure 23).

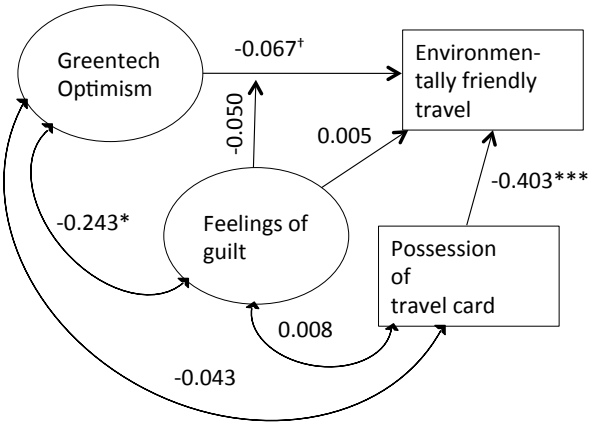

Figure 23: Unstandardized structural parameters of the moderator model 1dFG at wave 2. Feelings of guilt (FG) as moderator of the GTO - behavior relationship (SEM, type = random; missings listwise, N = 169; error terms of GTO_2 and GTO_4 freely intercorrelated)
† 1-tailed p < 0.05

The unstandardized regression weight of the path from GTO to environmentally friendly travel was B = -0.067 (p = 0.100), and B of the path from FG to environmentally friendly travel was = 0.005 (p = 0.895). The unstandardized regression weight of the interaction term FG x GTO was B = -0.050 (p = 0.138). The unstandardized regression weight of the intercorrelation between the error terms of GTO_2 and GTO_4 was 0.508 (p = 0.000). The intercorrelation between GTO and FG was B = -0.243 (0.047). Between

FG and travel card possession the intercorrelation was B = 0.008 (p = 0.826) and between GTO and travel card possession B = -0.043 (p = 0.269).

4.5.6 SEM results 2: GTO as moderator of dissonance - PMN relationship

The next two models describe the test of hypotheses H9 (Cognitive dissonance has a positive influence on the personal moral norm.) and H10 (The positive influence of cognitive dissonance on personal moral norm is negatively moderated by GTO.). The first of the two models (model 2T, see Figure 24) employed the treatment as independent variable, the second model (model 2FG, see Figure 25) used FG as independent variable.

Model 2T (treatment variable as factor)

The test of whether GTO acts as a negative moderator of the treatment - PMN relationship, was the only test that was computed 'within subjects'. A two-wave change model (see section 4.4.4) was modeled and tested. As the model included moderation, no model fit indices are reported.

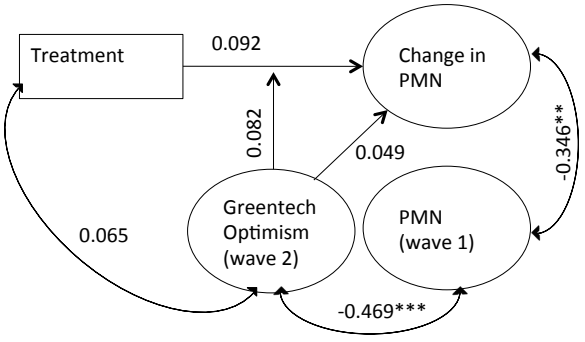

Figure 24: Unstandardized structural parameters of the two-wave change moderator model 2T. GTO as moderator of the treatment - PMN relationship (SEM, type = random; missings listwise, N = 169; error terms of GTO_2 and GTO_4 freely intercorrelated)

For the complete sample (N = 169) the unstandardized regression weight of the path between the treatment variable and 'Change in PMN' was B = 0.092 (p = 0.467), and the unstandardized regression weight between GTO and 'Change in PMN' was B = 0.049[21] (p = 0.463). The interaction term treatment x GTO had an unstandardized regression weight of B = 0.082 (p = 0.497). The intercorrelation between PMN at wave 1 and 'change in PMN' was B = -0.346 (p = 0.001), the intercorrelation between PMN at wave 1 and GTO at wave 2 was B = -0.469 (p = 0.000), and between the treatment variable and GTO at

[21] It has to be noted here, that this regression weight is meaningless, as there does not exist a hypothesis postulating an effect from GTO at wave 2 on change between PMN at wave 1 and PMN at wave 2. GTO is only expected to have an effect on PMN, when tested between subjects.

wave 2 was B = 0.065 (p = 0.102). Finally, GTO_2 and GTO_4 were intercorrelated with B = 0.516 (p = 0.000).

For the restricted sample (participants with at least one flight, N = 142) the unstandardized regression weight between the treatment variable and PMN was B = 0.135 (0.329), and B of the interaction term treatment x GTO and PMN was 0.144 (0.224).

Model 2FG (FG as factor)

The test of the moderation of the FG-PMN relationship by GTO can only be applied between subjects, as FG was only measured at wave 2, and does not represent a variable that varies systematically within subjects from wave one to wave two like the treatment variable does.

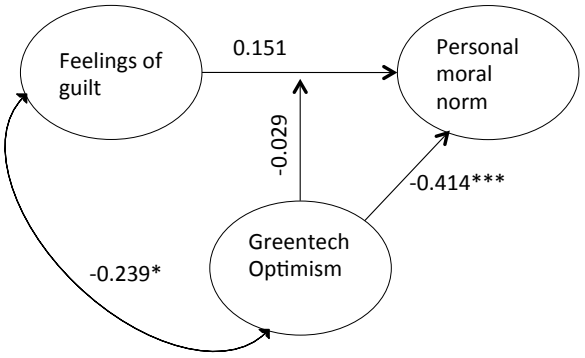

Figure 25: Unstandardized structural parameters of the moderator model 2FG at wave 2. GTO as moderator of the FG - PMN relationship (SEM, Type = random; missings listwise, N = 169; error terms of GTO_2 and GTO_4 freely intercorrelated)

Regarding its parameters this model is identical to the model 'GTO as factor of PMN, moderated by FG' (1cFG). The unstandardized regression weight of the path from GTO to PMN was B = -0.414 (p = 0.000), and of the path from FG was B = 0.151 (p = 0.132). The unstandardized regression weight of the interaction term FG x GTO was B = -0.029 (p = 0.762). The unstandardized regression weight of the intercorrelation between the error terms of GTO_2 and GTO_4 was 0.502 (p = 0.000), and the intercorrelation between GTO and FG was B = -0.239 (0.015).

Figure 26 shows the interaction effect in an interaction plot. The two slopes represent the regression of PMN on FG for low and for high levels of GTO. Both slopes were very gentle in angle and almost parallel. Hence, independently of the level of GTO, FG exerted a small (non-significant) influence on PMN. However, the large difference of the slopes' intercepts represents the strong negative main effect of GTO on PMN.

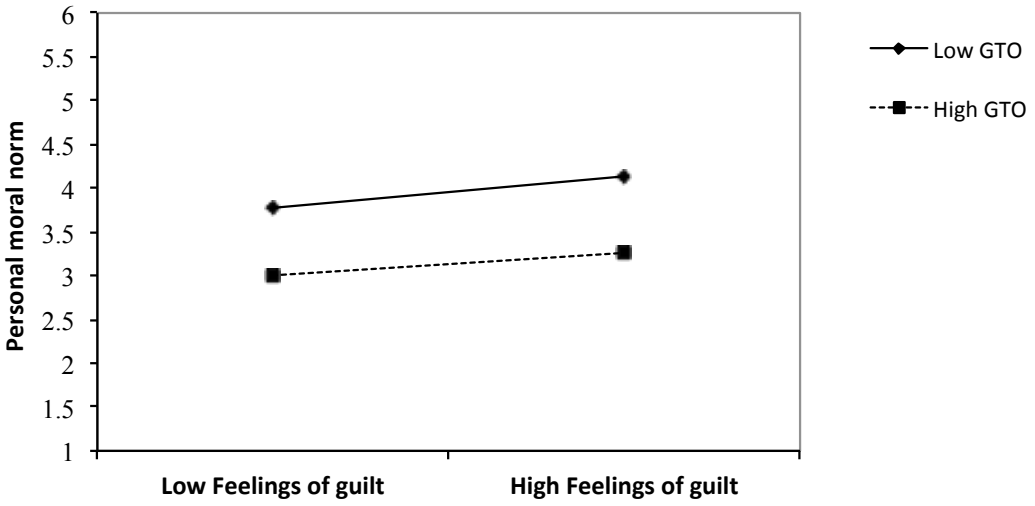

Figure 26: Interaction plot: Regression predicting personal moral norm for low (-1 *SD*) vs. high (+ 1 *SD*) GTO.

4.5.7 SEM results 3: GTO as moderator of PMN - behavior relationship

Model 3: GTO as moderator of PMN - behavior relationship

The following model (see Figure 27) shows the test of hypothesis H11, according to which the positive influence of personal moral norm on pro-environmental behavior is negatively moderated by GTO. This hypothesis was derived from Schwartz and Howard (1981) who described a denial process that consists of a negative moderation between personal moral norm and moral behavior by the moderator 'justification for non- action'. The test of the moderation of the relationship between PMN and environmentally friendly travel by GTO was applied between subjects, as environmentally friendly travel was only measured at wave two.

The unstandardized regression weight of the path from PMN to environmentally friendly travel was $B = 0.154$ ($p = 0.000$), and B of the path from GTO to environmentally friendly travel was = 0.010 ($p = 0.815$). The unstandardized regression weight of the interaction term PMN x GTO was $B = -0.008$ ($p = 0.799$), and the unstandardized regression weight of the covariate 'possession of travel card' amounted to $B = -0.321$ ($p = 0.000$). Additionally, the covariate was intercorrelated with GTO with $B = -0.041$ ($p = 0.198$) and with PMN with $B = -0.080$ ($p = 0.014$). The intercorrelation between GTO and PMN was $B = -0.403$ ($p = 0.000$). The unstandardized regression weight of the intercorrelation between the error terms of GTO_2 and GTO_4 was 0.514 ($p = 0.000$).

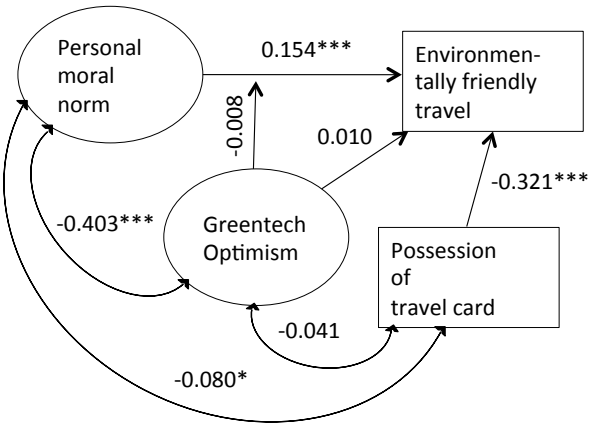

Figure 27: Unstandardized structural parameters of the moderator model 3 at wave 2. GTO as moderator of the PMN - behavior relationship (SEM, type = random; missings listwise, *N* = 169; error terms of GTO_2 and GTO_4 freely intercorrelated)

4.5.8 SEM results 4: GTO as moderator of dissonance - behavior relationship

Model 4: GTO as moderator of dissonance - behavior relationship

In this section hypotheses H12 (Cognitive dissonance has a positive influence on pro-environmental behavior.) and H13 (The positive influence of dissonance on pro-environmental behavior is negatively moderated by GTO.) are tested.

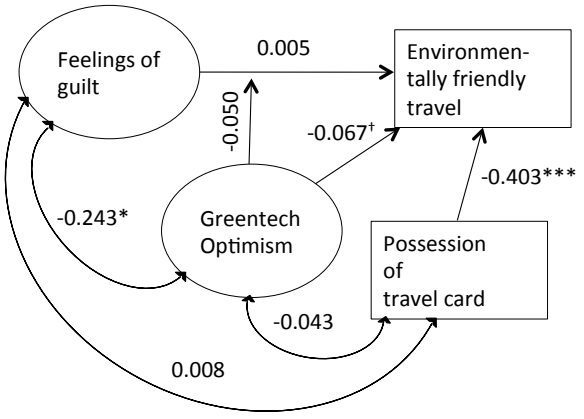

Figure 28: Unstandardized structural parameters of the moderator model 4 at wave 2. GTO as moderator of the FG - behavior relationship (SEM, type = random; missings listwise, *N* = 169; error terms of GTO_2 and GTO_4 freely intercorrelated)
† 1-tailed $p < 0.05$

Model 4 (see Figure 28) represents a synthesis of model 2, where GTO acted as a moderator of the dissonance-PMN relationship and of model 3, where GTO acted as a moderator of the PMN-behavior relationship. It is statistically identical to the model 1dFG: GTO as factor of pro-environmental behavior, moderated by FG.

The following model parameters were observed: The unstandardized regression weight of the path from GTO to environmental-friendly traveling was B = -0.067 (p = 0.100), and B of the path from FG to environmentally friendly travel was = 0.005 (p = 0.895). The unstandardized regression weight of the interaction term FG x GTO was B = -0.050 (p = 0.138). The unstandardized regression weight of the intercorrelation between the error terms of GTO_2 and GTO_4 was 0.508 (p = 0.000). The intercorrelation between GTO and FG was B = -0.243 (0.047).

4.6 Discussion

4.6.1 Summary of the results

Quality of the GTO scale

The original GTO scale, comprising 12 items (two items on each topic), showed (with the exception of item GTO_1 at both waves and GTO_7 at wave one) factor loadings above $\beta = 0.570$. It is supposed that the low loading of GTO_1 was due to its reference to 'green technologies' in general, which despite a short explanation in the questionnaire might have been too non-specific for the participants at the first presentation. The low loading of GTO_7 might have been due to the general 'green' quality of public transport. The scale was then shortened to five items, comprising one item per each topic (from the second list), excluding the item covering the topic of public transport. In this scale two items loaded with β around 0.500 (GTO_2 and GTO_4) and three items around 0.750 or higher (GTO_6, GTO_{10}, GTO_{12}). A closer look at these items revealed that the high loading items cover specific everyday technologies (household appliances, cars, airplanes), whereas the low loading items refer to the non-specific term 'green technologies', respectively to renewable energy sources in general. To ensure comparability between studies I and II, the low loading items were not excluded from the scale.

The model fit of the shortened GTO scale was between acceptable and good regarding the CFI index (0.963 at wave 1; 0.965 at wave 2), which is recommended by Schermelleh-Engel, Moosbrugger, and Müller (2003, p. 42) for small sample sizes. Cronbach's α values of 0.871 (wave 1) and 0.841 (wave 2) speak for a good internal consistency of the GTO scale. Test-retest-reliability was $\beta = 0.723$ ($p = 0.000$) for the treatment group ($N = 79$) and $\beta = 0.807$ ($p = 0.000$) for the control-group ($N = 90$). Finally, QQ-plots and histograms showed approximately normal distributions of the GTO scale at the two waves. However, at wave 2 scores of 5 and higher were observed less than expected. At wave two the distribution showed high kurtosis values.

In light of these results, Hypothesis H1, according to which greentech optimism is a valid and reliably measurable construct, which is approximately normally distributed, was confirmed.

Quality of other scales

PMN (shortened scale)

CFI at wave 1 was 0.996, and CFI at wave 2 0.970, which indicated a good model fit of the scale. Cronbach's α is 0.893 at wave 1 and 0.908 at wave 2. Test-retest reliability was $\beta = 0.890$ for the control group and 0.908 for the treatment group. A look at the factor loadings revealed, that PMN_1, which is the item that covers the avoidance of long-haul

flights, shows a lower loading than the items referencing to the avoidance of choosing the airplane, when traveling to a European city over a long weekend. Therefore, it is conceivable that PMN_1 measured something slightly different to the other PMN items. Nonetheless, for the sake of model parsimony, we refrained from modeling the PMN construct as a second-order construct. Altogether, the PMN construct turned out to be of good reliability.

Problem awareness (PA) and *awareness of consequences (AC)*

Internal consistency of PA was $\beta = 0.546$ ($p = 0.000$) at wave 1 and $\beta = 0.688$ ($p = 0.000$) at wave 2. Test-retest reliability for PA was $\beta = 0.933$ for the control group and 0.912 for the treatment group. Internal consistency of AC was $\beta = 0.661$ ($p = 0.000$) at wave 1 and $\beta = 0.668$ ($p = 0.000$) at wave 2. Test-retest reliability for AC was $\beta = 0.981$ for the control group and 0.913 for the treatment group. Altogether, the PA and the AC constructs turned out to be of good reliability.

Feelings of guilt (FG), *feelings of hypocrisy (FH)*, and *feelings of guilt 'proxy' (FGproxy)*

The only measure to estimate the reliability of FG is the standardized regression weight between the two items at wave 2. This was $\beta = 0.789$ ($p = 0.000$). The factor loadings of FH_1 and FH_2 were twice as high as the loading of FH_3. It is supposed, that the reason why FH_3 did not fit in the measurement model, was the travel-specific item formulation. The item was therefore excluded from the FH scale and used separately for the manipulation check. Internal consistency of FGproxy was $\beta = 0.606$ ($p = 0.000$) at wave 1 and $\beta = 0.703$ ($p = 0.000$) at wave 2. Test-retest reliability for FGproxy was $\beta = 1$ for the control group and 0.932 for the treatment group.

Behavioral measure

The behavioral measure (choosing the railway lottery or airline lottery) showed a very even distribution. Among the total sample 50.9% chose the railway lottery and 49.1% chose the airline lottery. Together with the covariate 'possession of travel card' the measure served as a good measure for pro-environmental behavior.

Altogether, the measures used showed good reliability values. However, the reliability estimation of PA, AC, FG, and FH would have been clearer if they had been measured with at least three items per construct.

Quality of treatment

Unfortunately, the treatment did not result in the expected effect, namely the induction of feelings of dissonance. No significant treatment effects have been observed in the manipulation check.

Treatment effects have been tested by estimating the regression of different measures of dissonance on the treatment variable. FG and FH were each captured by a travel-specific measure and a general measure. The tests revealed that in trend, the treatment had effects in line with the hypothesis on travel-specific measures and effects opposite to the hypothesis on general measures. A plausible explanation of this paradox lies in the two-fold structure of the treatment text. The first part assigned positive environmental attitudes to the participants and may have dissolved the participants' non-specific feelings of guilt towards the environment. In contrast, the second part of the treatment, making the participants aware of their individual 'environmental sins' concerning their travel behavior, seems to have increased travel-specific feelings of guilt. However, these effects, which were in trend in line with the treatment hypothesis, were far from being significant for the sample size of $N = 169$ (even when tested 1-tailed).

Tests were carried out also for samples, which excluded participants who had not reported at least one flight (restricted sample: $N = 142$), respectively at least two flights ($N = 107$). Although the effects on the travel-specific measures increased in size when tested with the restricted samples, significant effects were still not reached. Because of these inconsistent and insignificant treatment effects, any modeling that involved the treatment variable was applied also with measured feelings of guilt (travel-specific) as a substitute for the treatment variable.

Post-hoc tests revealed that in trend, GTO moderates (but not significantly) the treatment effect on FG ($B = -0.073$, $p = 0.742$) and on FH ($B = -0.116$, $p = 0.595$). Hence, it appears that GTO not only may weaken the behavioral effect emanating from cognitive dissonance but also may inhibit the generation of feelings of dissonance. This assumption is corroborated by the finding that FG were negatively correlated with GTO ($\beta = -0.239$, $p = 0.015$, see section 4.5.5). An additional post-hoc test showed that GTO negatively moderated the relationship between FH and FG ($B = -0.192$, $p = 0.009$). Although a bit speculative, the assumption could be drawn that, when GTO is high, the perception of one's own hypocrisy on a cognitive level does not necessarily has to come along with feelings of guilt. Future research on the role of GTO in the processes responsible for the generation of aversive feelings of dissonance seems to be of particular importance.

GTO as a factor

GTO as factor in personal moral norm and pro-environmental behavior

Two models were tested in order to investigate the effects of GTO on PMN and on pro-environmental behavior: a complete model, which includes also the hypothesized mediators problem awareness (PA) and awareness of consequences (AC), and a short model, which omitted the mediators PA and AC for the sake of enhanced statistical power, as the sample size of $N = 169$ is rather small for the complete model (see section 4.5.5).

Both models showed good model fit: CFI was 0.965 for the complete model and 1.000 for the short model. GTO had a highly significant total effect on PMN (β = -0.366*** in the short model) and a highly significant indirect effect on pro-environmental behavior (β = -0.177**). The complete model revealed additionally that the total effect of GTO on PMN was mediated by AC (indirect effect of GTO on PMN via AC was β = -0.171**) and (only as a trend) by PA (β = -0.065, p = 0.251). Besides these indirect effects, there was also a direct effect from GTO on PMN of β = -0.136 (p = 0.072). The path from GTO to pro-environmental behavior via AC and PMN amounted to an indirect effect of β = -0.082**, which is slightly higher than the effect via PMN alone (β = -0.065, p = 0.098). The path via PA and PMN accounted only for an insignificant effect of β = -0.030 (p = 0.255). GTO explained 13.4% of variance in PMN and 2.7% in pro-environmental behavior.

In light of these results, the hypotheses H2, H4, H5 and H6 were confirmed. However, H3 (mediator PA) had to be rejected[22].

Role of the moderator dissonance within the relationship between GTO and PMN

The role of feelings of dissonance as moderator of the GTO-PMN relationship was first modeled with the treatment variable and then with measured FG. In both cases the GTO-dissonance interaction effect on PMN was around zero. In the case of the treatment variable, the interaction effect was slightly positive (β = 0.048, p = 0.817) and in the case of measured feelings of dissonance the interaction effect was slightly negative (-0.029, p = 0.762). Hence, hypothesis H7, according to which the negative relationship between GTO and PMN is negatively moderated by feelings of dissonance had to be rejected for the use of the treatment variable as well as for the use of measured feelings of guilt. However, in the case of the use of measured feelings of guilt, the trend of the interaction effect was in line with the hypothesis.

Role of the moderator dissonance within the relationship between GTO and pro-environmental behavior

The analysis of the moderation effect of dissonance and GTO on pro-environmental behavior was only carried out with measured FG. The analysis with the treatment variable

[22]H2: GTO has a negative influence on the personal moral norm (feeling of personal responsibility to show environmentally responsible behavior).

H3: The negative influence of GTO on the personal moral norm is mediated by problem awareness.

H4: The negative influence of GTO on the personal moral norm is mediated by awareness of consequences.

H5: Personal moral norm has a positive influence on pro-environmental behavior.

H6: GTO has an indirect negative influence on pro-environmental behavior, via personal moral norm.

was omitted, as the previous analysis had shown that the interaction effect of GTO with the treatment variable on PMN was positive and not negative as expected. However, the GTO-dissonance interaction on pro-environmental behavior, when carried out with measured feelings of guilt resulted in a negative effect of β = -0.050 (p = 0.138). As this effect is statistically non-significant, hypothesis H8, according to which the negative influence of GTO on pro-environmental behavior is negatively moderated by cognitive dissonance, had to be rejected.

The results so far summed up, showed that GTO acts as a negative direct and indirect factor of PMN and as a negative indirect factor of pro-environmental behavior. However, these effects were not significantly moderated by feelings of dissonance.

The role of GTO as negative moderator

In this section a summary of the results concerning the hypotheses related to GTO as negative moderator of the positive influence of feelings of dissonance on PMN and pro-environmental behavior is provided (H9 to H12).

Role of the moderator GTO within the relationship between dissonance and PMN

The role of GTO as a negative moderator of the treatment-PMN relationship was modeled 'within subjects' (two-wave change model) and also between subjects. In both models the interaction effect B of treatment and GTO on PMN was positive but very small and not significant (within model: 0.082, p = 0.497; between model: 0.048, p = 0.817). The direct effect of the treatment on PMN was B = 0.092 (p = 0.467) in the 'within subjects' model and B = 0.183 (p = 0.357) in the 'between subjects' model. Using the measured FG instead of the treatment variable, the interaction effect of measured feelings of guilt with GTO on PMN was negative (B = -0.029) but not significant (p = 0.762). The direct effect of feelings of guilt on PMN was B = 0.151 (p = 0.132).

Rejection of H9 and H10: Hypothesis H9, which postulates that cognitive dissonance has a positive influence on the personal moral norm, had to be rejected. Hypothesis H10, according to which the positive influence of cognitive dissonance on personal moral norm is negatively moderated by GTO, had to be rejected as well.

Role of the moderator GTO within the relationship between PMN and pro-environmental behavior

The test of the interaction effect of GTO and PMN on pro-environmental behavior revealed an effect of B = -0.008 (p = 0.799). Hence, hypothesis H11 'The positive influence of personal moral norm on pro-environmental behavior is negatively moderated by GTO' had to be rejected.

Role of the moderator GTO within the relationship between dissonance and pro-environmental behavior

This last model was tested in order to investigate if the negative moderation effects of GTO in the dissonance - PMN relationship and in the PMN - behavior relationship accumulate to a total negative moderation effect of GTO on the dissonance - behavior relationship. The model was tested only with the measured dissonance (FG), as the moderation effects on treatment-PMN and PMN-behavior turned out to be positive.

The interaction effect of GTO and FG on pro-environmental behavior was B = -0.050 (p = 0.138). Hence, it appears that the negative moderation effects (-0.029 and -0.008) accumulated to a stronger (although still not significant) effect. The direct effect of FG on pro-environmental behavior was 0.005 (p = 0.895). Therefore, hypothesis H12 'Cognitive dissonance has a positive influence on pro-environmental behavior' had to be rejected. Hypothesis H13, according to which the positive influence of dissonance on pro-environmental behavior is negatively moderated by GTO, had to be rejected as well.

All hypotheses (H9 to H12) assuming GTO as a negative moderator, which acts as a buffer to the influence of dissonance feelings on PMN and behavior, had to be rejected. Whereas modeling dissonance feelings with the treatment variable tended to result in (non-significant) positive interaction effects, modeling them with measured FG resulted (in trend) in (non-significant) negative interaction effects.

4.6.2 Interpretation of the results

The GTO scale

The first result to be interpreted is the quality of the GTO scale. The results show that the GTO scale is reliable in terms of internal consistency as well as in terms of test-retest reliability. As it is approximately normally distributed among the population, the GTO scale as measured in this study represents a well-calibrated measure of optimism towards the problem-solving capacity of greentech.

However, CFAs indicate that the GTO scale might also be considered a second-order construct, distinguishing between items referring to specific everyday technologies (such as household appliances, cars, and airplanes) and items that are formulated in a more general way ('green technology', 'renewable energy'). With a less highly educated sample, the use of non-specific items may therefore be considered thoroughly, as problems of unambiguous comprehension of the items might occur.

The treatment procedure

Unfortunately, the treatment did not result in the expected effects. The manipulation checks revealed insignificant and inconsistent findings. Altogether, the effects of the treatment were too small.

Aronson et al. (1991) and Kantola et al. (1984) both succeeded in inducing dissonance. However, each of these studies considered one aspect that was not considered in this current study and that might have enhanced the treatment effect. In the case of Aronson et al. (1991) it was the fact, that the pro-environmental statement had to be made in public (video message), and in the case of Kantola et al. (1984) the stronger treatment effect was achieved by restricting the sample to persons who showed high energy consumption and who had advocated pro-environmental attitudes in a previous study. Hence, both studies had better start conditions for the induction of dissonance feelings in their participants.

However, the fact that this current study used a cover story made it impossible to ask the participant for a public pro-environmental statement. The credibility of the cover story would have suffered a lot. Still, narrowing the sample recruitment to persons with a certain minimal mobility behavior, might have enhanced the treatment effect. The a-posteriori exclusion of participants, that had not reported at least one flight journey within the last two years corroborates this assumption.

The fact that the treatment had inconsistent effects on different dissonance measures, also sheds light on the complexity and somewhat fuzziness of the construct of feelings of dissonance. As we saw in the theory section on dissonance (see section 3.7.1), cognitive dissonance is a ”psychologically uncomfortable” state of mind (Festinger, 1957, p. 3) that can occur in different qualities. Feelings of guilt and feelings of hypocrisy are two of them (Aronson, 1992). If there exist different qualities of feelings of dissonance, the question arises, as to whether the quality of dissonance that was induced in this study really matches the quality of dissonance that is part of the study's theoretical model.

At the very beginning of this dissertation feelings of dissonance were introduced by way of Stoll-Kleemann et al. (2001), who assumed that individuals suffer from feelings of dissonance when they are aware that climate change is a threat to be reckoned with and at the same time are not willing to change their current lifestyles. This dissonance can be resolved by individuals through denial of responsibility: ”To overcome the dissonance created in their minds they created a number of socio-psychological denial mechanisms” (p. 107).

Hence, the original type of feelings of dissonance relevant to the responsibility denial model is the feeling of dissonance that arises when individuals perceive that the behavior they should show stands in contrast to high behavioral costs ('change of current lifestyles') related to this behavior. It is this discrepancy between knowledge of the behavior that

would be morally appropriate and its related behavioral costs that leads to feelings of dissonance.

The mechanism by which dissonance can be reduced in such a situation is the reconciliation of the two dissonant elements by a third element. In Festinger's (1957) example, the people of Ifaluk (Micronesia) reduce the dissonance between their firm belief that children are genuinely good and the fact that children are sometimes aggressive by adding a third cognitive element–the belief that malevolent ghosts enter into children and "cause them to do bad things" (p. 23). Likewise, greentech optimism serves as a reconciling element for the dissonant cognitions 'knowledge of which behavior would be morally appropriate' and 'high behavioral costs of this behavior'. With greentech optimism one can get rid of the feelings of dissonance without showing the morally appropriate behavior.

Although feelings of guilt and feelings of hypocrisy are also types of dissonance feelings, it cannot be taken for granted that they lead exactly to the same dissonance reduction strategies as the type of dissonance feelings that emanate from the perceived discrepancy between knowledge of the behavior that would be morally appropriate and its related behavioral costs. Thus, feelings of guilt and feelings of hypocrisy might be uncomfortable psychological states that can serve as proxies for the latter type of dissonance; however, their quality is not exactly the same.

A treatment procedure that induces an uncomfortable psychological state by making the participant aware of the discrepancy between the moral appropriateness of a certain behavior and the high behavioral costs of this behavior would be a promising resource for future research on dissonance reduction processes.

GTO as a factor in PMN and pro-environmental behavior

The modeling of GTO as a negative factor in PMN and pro-environmental behavior led to results consistent with the hypothesized models. Optimism towards the problem-solving capacity of greentech has negative influences on the feeling of personal responsibility to act in pro-environmental ways. The strong regression path from PMN to pro-environmental behavior accounts for the additional result that even significant indirect effects of greentech optimism on pro-environmental behavior were detected.

These influences are partly direct and partly mediated by awareness of consequences. The result that greentech optimism has a negative influence on awareness of consequences means that the higher people's greentech optimism, the smaller their estimation of the consequences of their own behavior. This result can be interpreted by referring to environmental problems as commons dilemmas (Hardin, 1968). As environmental problems are of commons dilemma character, it can be assumed that the impact of an individual's behavior is compared to the potential impact of others' behavior and to the potential impact of technological solutions to the problem. Thus, the more that people assume that

greentech contributes to the solution of environmental problems, the less relevant their own pro-environmental behavior seems. As awareness of consequences is at the same time a strong predictor of feelings of personal responsibility to show pro-environmental behavior, the latter fades with increasing greentech optimism.

In terms of moral licensing theory (see sections 1.3.2 and 1.3.3), it could be argued that the optimism that green technology will solve the environmental problems is responsible for a vicarious licensing effect (see Table 1), as greentech optimism changes the moral balance (see figure 2) towards a preponderance of good deeds. As a consequence, morally questionable behavior is acceptable, until the moral equilibrium is re-established.

Although problem awareness did not act as a significant mediator of the negative influence of greentech optimism on personal moral norm, it is worth highlighting the fact that greentech optimism is highly negatively correlated with problem awareness. Hence, it could be concluded, that the more people believe that greentech contributes to the solution of environmental problems, the smaller their estimation of the 'remaining problem size' is. However, as the regression weight between problem awareness and personal moral norm is not big enough, the strong negative effect of greentech optimism on problem awareness does not result in a significant indirect effect on personal moral norm. Nonetheless, the existence of such a negative indirect effect via problem awareness should not be rejected a priori. As problem awareness and awareness of consequences are highly intercorrelated, a large part of the covariance each of the mediators shares with personal moral norm is redundant. Hunecke (2000) reported similar redundancy conditions between his model predictor 'problem awareness' with other predictors.

It has to be noted that the results represent relationships 'between subjects'. As the modeling of the hypothesized relationships between the variables was carried out on the basis of covariances 'between subjects' at one point in time and not on the basis of covariances 'within subjects' (repeated measures), the detected relationships do not represent intra-individual or causal relationships. Only by referring to theory assumptions about causality can be drawn.

Feelings of dissonance as moderator of the GTO effect

Neither the relationship between greentech optimism and personal moral norm nor the relationship between greentech optimism and pro-environmental behavior appeared to be significantly dependent on the level of dissonance. The results of the several moderation models showed that independent of the level of dissonance, greentech optimism is negatively related to personal moral norm and behavior.

This finding could indicate that (a) the dissonance variables used in the model (treatment variable, measured feelings of guilt) represent a non-relevant type of dissonance for the responsibility denial process of interest, and/or (b) that for all participants the dis-

sonance level was above a threshold above which negative greentech optimism effects emerge and above which an increase in feelings of dissonance does not significantly affect the strength of these negative greentech optimism effects. Both explanations seem to be plausible, as will be demonstrated in the following two paragraphs.

As pointed out in the section above on the treatment procedure, the treatment procedure, which relied on the induced hypocrisy paradigm (Aronson et al., 1991), attempted to produce variance between the treatment group and the control group in terms of feelings of hypocrisy (which according to Aronson (1992) are a representation of feelings of dissonance), whereas the measure used for feelings of dissonance was feelings of guilt (which according to Aronson (1992) are another representation of feelings of dissonance). The short recapitulation on dissonance theory in the section above on the treatment procedure recalled the fact that the theoretically hypothesized responsibility denial mechanism relies on feelings of dissonance, which emerge from the dissonant cognitions 'knowledge of the morally appropriate behavior' and 'high behavioral costs of this behavior'. Hence, with induced feelings of guilt and feelings of hypocrisy, only proxies to this specific type of feelings of dissonance were available in the modeling process.

It is further plausible to assume that in the case of pro-environmental travel, the behavioral costs of taking the train instead of flying are perceived to be very high, as choosing the train is connected with a lot of inconvenience (duration of travel, loss of time at the travel destination, smaller choice of destinations). Therefore, the existence of high levels of dissonance is also very plausible, which could explain the consistent negative GTO effects.

Greentech optimism as a negative moderator of the dissonance effects

As the hypothesized moderator effect of greentech optimism within the dissonance-personal moral norm and the dissonance-behavior relationship is statistically represented by the same interaction effect as the moderation effect of dissonance within the greentech optimism effects; the findings are the same as in the section before. However, the interpretation may take a slightly different perspective. The relationship between dissonance (either as treatment variable or as feelings of guilt) and personal moral norm and the relationship between dissonance and pro-environmental behavior are statistically independent of the level of greentech optimism. In any of the models tested, dissonance is slightly positively related to personal moral norm and behavior. However, in none of the models is this positive relationship statistically significant.

The rejection of hypothesis H13, according to which the positive influence of dissonance on pro-environmental behavior is negatively moderated by GTO, might be due to the following reasons:

(a) The dissonance variables used in the model (treatment variable, measured feel-

ings of guilt), are not of the exact dissonance type that is relevant for prompting pro-environmental behavior. The relevant type would be dissonance emerging from the dissonant cognitions 'knowledge of the morally appropriate behavior' and 'high behavioral costs of this behavior'. This type of dissonance feelings can be resolved in two ways, either by showing the morally appropriate behavior or by being optimistic that greentech will solve the problem. If the type of dissonance used in the model is only a proxy to the described type of dissonance, greentech optimism might not be the element which is able to reconcile the cognitions in dissonance.

(b) The level of dissonance in the sample is above a certain threshold above which a further increase in dissonance does not lead to increase in feelings of moral obligation to act pro-environmentally. As the strength of the moderation effect is dependent of the strength of the predictor-criterion relationship, the moderation effect of greentech optimism within the weak relationships between dissonance and personal moral norm, respectively dissonance and pro-environmental behavior, is of limited strength, too.

5 General discussion

In the general discussion section the level of achievement of the five research goals as postulated in the introduction section (1.4.1) will be discussed. Consequently, the first section (5.1) will address the issue of drawing some final conclusions on the quality (and shortcomings) of the GTO scale developed here. The following section (5.2) will deal in-depth with the findings regarding the responsibility denial hypothesis (goal two) and its underlying psychological mechanisms (goals 3 and 4). Then, limitations and issues for future research (section 5.3) will be discussed. Finally, conclusions from a practical perspective round up this dissertation (section 5.4). The research goals as postulated in section 1.4.1 were the following:

1. Develop a GTO scale: Development of a reliable and valid scale that measures optimism towards the problem-solving capacity of greentech.

2. Test the responsibility denial hypothesis: Test of the hypothesis that greentech optimism weakens individuals' willingness to act in environmentally responsible ways.

3. Develop a psychological process model: Theory-based development of a model specifying the underlying socio-psychological processes that lead to responsibility denial.

4. Test the psychological process model: Inference-statistical test of the psychological process model.

5. Derive policy implications.

5.1 Development of s GTO scale (Research goal 1)

In both studies, the GTO scale proved to be approximately normally distributed and reliable in terms of internal consistency. In study II, a high test-retest reliability was revealed as well.

The construction of the GTO scale followed a thorough theoretical analysis. Moreover, a pretest was carried out that, besides quantitative items, asked for comments on the adequacy and the comprehensibility of the tested items and that led to the modification and the exclusion of items. Thus, although no quantitative measures for divergent or convergent validity are provided in this dissertation, the scale disposes of the prerequisites for a good content validity (see Rossiter, 2002, 2008).

Altogether, the GTO scale represents a reliable and valid measure for optimism towards the problem-solving capacity of greentech. Hence, research goal 1 'Development

of a GTO scale' was achieved. However, CFAs in study II indicate that the GTO scale might also be considered a second-order construct, distinguishing between items referring to specific everyday technologies (such as household appliances, cars, and airplanes) and items that are stated in a more general way ('green technology', 'renewable energy'). Items referring to 'green technology' or 'renewable energy' may not be fully understood by lay people. As the samples in the two studies consisted to a large extent of highly educated persons, there does not seem to have been a risk of unambiguous comprehension of these items; however, for future research the use of the respective items may be considered thoroughly.

5.2 Mechanisms of responsibility denial (research goals 2 - 4)

5.2.1 Comparison of the findings from study I and II

Study I and study II aimed at modeling responsibility denial processes due to greentech optimism on a quantitative and theoretically integrated basis. Two models were proposed: one postulating a negative relationship between greentech optimism and personal moral norm, and one postulating that greentech optimism and feelings of dissonance influence each other's relationship with personal moral norm. Table 20 provides an overview of the confirmation and rejection of the two models.

After the original process model (greentech optimism as negative factor of personal moral norm) had to be rejected in study I (greentech optimism and conservation in households), a modified model was postulated that included feelings of dissonance as a moderator of the negative greentech optimism-personal moral norm relationship and was tested with the data from study I.

The data from study I supported the modified process model (statistical interaction between greentech optimism and feelings of dissonance), and it was concluded that feelings of dissonance are a prerequisite for the responsibility denial process.

It was further elaborated that from a theoretical as well as a statistical perspective, the support for the modified process model can be interpreted also as follows: Greentech optimism acts as a negative moderator of the positive relationship between feelings of dissonance and personal moral norm. The higher the level of greentech optimism, the smaller the relationship between feelings of dissonance and personal moral norm is. Thus, the more that people believe in the problem-solving capacity of greentech, the less their feelings of dissonance urge them to show pro-environmental behavior.

In study II both the original process model (greentech optimism as negative factor of personal moral norm) and the modified process model (interaction between greentech optimism and feelings of dissonance) were tested in the behavioral field of environmentally friendly travel. In this setting the original process model was confirmed, but the modified process model had to be rejected. Hence, this time the data supported the hypothesis that greentech optimism has a negative influence on feelings of personal responsibility to show pro-environmental behavior, irrespective of the level of feelings of dissonance.

Table 20:
Confirmation and rejection of original process model and modified process model in study I and study II

Process model	Study I: Household	Study II: Travel
Original process model: GTO as negative factor	rejected	confirmed
Modified process model: Interaction GTO x dissonance	confirmed	rejected

How can these findings, at first glance inconsistent, be explained? Two strains of explanation are provided in the following: First, the different findings can be assumed to stem from the different fields of behavior, and second, there are methodological issues to be discussed that could help us to understand the different findings.

5.2.2 Behavioral fields as cause for differences

Generally, it can be concluded that a negative relationship between greentech optimism and personal moral norm is likely to occur, if feelings of dissonance are beyond a critical level. In study I it was shown that whereas for average and low feelings of guilt (as proxy for feelings of dissonance) the slope between greentech optimism and personal moral norm was positive, it was negative for high feelings of guilt (see section 3.7.5). In study II the greentech optimism-personal moral norm relationship is negative independent of the level of feelings of guilt.

It is therefore assumed that in the behavioral field of environmentally friendly travel, the magnitude of dissonance is constantly above a specific level that is necessary for a negative greentech optimism-personal moral norm relationship to occur. In the field of conservation in households, however, it is assumed that for the large part of the sample, feelings of dissonance do not reach the critical level. These assumptions are corroborated by the following reflections on the magnitude of dissonance in the two behavioral fields. This magnitude, as Festinger (1957) stated, varies dependent on the importance of the dissonant elements: ”If two elements are dissonant with one another, the magnitude of the dissonance will be a function of the importance of the elements” (p. 16).

To compare the magnitude of dissonance in the two behavioral fields, it is necessary to recall the elements that are relevant for the emergence of feelings of dissonance in the case of moral behavior. As elaborated in section 3.2.2 Schwartz and Howard (1981) related two elements to the emergence of personal moral norms: ”...a cognitive component of self-based expectations directing behavior and an emotional component of anticipatory self-satisfaction or dissatisfaction” (p. 191).

Schwartz and Howard (1981) further pointed out that the emotional component is arousing, and that this arousal motivates behavior. Thus, if an individual’s self-based expectations to show a specific morally correct behavior are high, the individual can be expected to perform this respective behavior, unless the specific behavior is connected to high behavioral costs. In the latter case, the individual may anticipate not to perform the morally correct behavior which in consequence leads to feelings of dissonance, or as Schwartz and Howard would say, ”feelings of self-dissatisfaction”. Hence, regarding moral decision making, the relevant elements that may lead to feelings of dissonance are on the one hand individual moral self-expectations regarding a specific behavior (”it is

important that I show behavior x"), and on the other hand the behavioral costs related to this specific behavior ("behavior x brings about the behavioral costs y"). Cooper and Fazio (1984) corroborated the suggestion that behavioral costs are an important prerequisite for the emergence of cognitive dissonance: "If there is no aversive event that might be expected to occur following an action, then that action will not lead to the arousal of cognitive dissonance" (p. 232).

While it is not clear whether the moral self-expectations regarding environmentally friendly behavior differ substantially between the two behavioral fields, there is reason to believe that the behavioral costs of environmentally friendly behavior are higher in the field of travel than in the field of conservation in the household.

What are the behavioral costs related to energy conservation in the household? The investigated categories of environmentally friendly behavior in study I were 'switching off unused lights', 'avoiding standby power', 'hanging up washing instead of using the tumble dryer', and 'washing laundry at the lowest possible temperature'. The behavioral costs of the first two behavioral categories are without doubt very low. These behaviors are very easily performed, if we remember to do so. However, switching off lights may be related to a certain loss of a cozy ambiance at home. The conservation behaviors regarding laundry may be related to concerns about sufficient hygiene (low temperature washing) and to the additional physical work and time necessary for hanging up the laundry. If the apartment building provides no specific room for hanging laundry, then there can be an additional inconvenience due to the space needed in the apartment.

On the whole, the behavioral costs may mean inconvenience and extra work; however, they do not seem to cause feelings of relinquishment, as no important needs or values are at risk. Moreover, as these behaviors are performed on a daily basis, they become habitual, meaning that possible behavioral costs may not be consciously reflected.

What behavioral costs are connected with pro-environmental travel behavior? The following behavioral costs of avoiding air travel, when it comes to decisions regarding vacation travel, are conceivable. In the case of choosing to take a train rather than fly to the proposed destinations in the questionnaire, travel durations are about three to five times longer. For a lot of destinations, customer care and service (on board as well at check-in) are more convenient in the case of air travel. Additionally, choosing to go by train means higher monetary costs. These objective costs related to train traveling may be complemented by symbolic costs, as traveling is semantically associated to freedom and joy (cf. Opaschowski, 1999). Hence, restrictions to the freedom of travel mode or the free choice of a destination for the sake of environmental protection are expected to result in feelings of relinquishment. Unlike the conservation behaviors regarding the household, decisions of travel mode and choice of destinations for vacations are not of habitual character, as they have to be performed only few times a year. Hence, these

decisions are assumed to be made consciously, reflecting the behavioral costs of pro-environmental behavior.

All in all, there is reason to assume that the behavioral costs of the pro-environmental behavior investigated in study II are higher than the behavioral costs related to the pro-environmental behavior in study I. Thus, it seems rational to suggest that the subjective levels of dissonance in study II were higher than in study I.

In goal-framing theory Lindenberg (2008) corroborates the assumption that more dissonance between behavioral costs of pro-environmental behavior and moral self-expectations is perceived in the travel context than in the household context. Goal-framing theory postulates that depending on the context of a situation cognitive processes are guided by either hedonic goals, gain goals, or normative goals. Whereas in the context of household activities none of these goals may be especially dominant, it may be assumed that in the travel context it is the hedonic goals that guide cognitive processes. If a person is immersed in the hedonic goal-frame, behavioral costs of pro-environmental behavior stand in strong contrast to the main goal of "to improve the way one feels right now" (Lindenberg, 2008, p. 672), thus creating feelings of dissonance.

If there is no dissonance related to the pro-environmental behavior, denial mechanisms are not to be expected. It has been shown by other researchers that regarding pro-environmental behavior, easy-to-perform behaviors are more likely to be executed (Kaiser, Byrka, & Hartig, 2010) and are closer correlated to pro-environmental attitudes (Diekmann & Preisendörfer, 1992) than pro-environmental behavior that is related to higher behavioral costs. Thus, it is suggested that the responsibility denial mechanism due to greentech optimism described here can lend itself as explanation for the phenomena described by Kaiser et al. (2010) and Diekmann and Preisendörfer (1992). The higher the behavioral costs of a particular pro-environmental behavior, the more likely it is that psychological responsibility denial mechanisms like the ones described in this dissertation are likely to play a role.

5.2.3 Methodological issues as cause for differences

Besides the different behavioral fields focused on in the two studies, there also exist considerable differences regarding the composition of the two samples. On the one hand, the sample size differs to a large extent, resulting in distinct levels of test power. On the other hand, and more importantly, the self-selective sampling in the two studies is assumed to have resulted in qualitatively different samples regarding environmental concern.

Study I was advertised in the recruitment process as a "study on power conservation in the household", whereas study II was advertised as a "travel study". Thus, study I is assumed to have been especially appealing to participants interested in conservation

issues, whereas the cover story of study I may have attracted individuals interested in travel. As a consequence, it is conceivable that the sample of study I perceived behavioral costs of pro-environmental behavior as low generally, irrespective of the behavioral field, whereas in study II no such bias is expected. In contrast, in study II persons who attach high importance to the freedom of travel might be especially sensitive to moral-based restrictions to this freedom. Hence, higher levels of dissonance have to be expected for the travel sample.

Additionally, in study I a social desirability bias on items related to environmental issues (e.g., personal moral norm) cannot be excluded. Such a bias might also have affected the greentech optimism items, meaning that greentech optimism items may be biased towards high scores. Thus, it is conceivable that such parallel social desirability bias affecting personal moral norm and greentech optimism may be partly responsible for the observed positive relationship between greentech optimism and personal moral norm in study I. Unfortunately, a social desirability measure that could have lent itself to the statistical control for such bias was only applied in study II.

Finally, differences in wording and positioning of the feelings of guilt items are assumed to have brought about differences in the strength of the relationship between feelings of guilt and personal moral norm. Whereas in the online questionnaire of study I feelings of guilt and personal moral norm items were presented together in one list, they were presented separately in the online questionnaires of study II. Moreover, in study I the feelings of guilt and personal moral norm items were of rather similar wording, which was not the case in study II. It is conceivable that in study I the strength of the relationship between feelings of guilt and personal moral norm is overestimated due to a common methods bias. An overestimation of the feelings of guilt-personal moral norm relationship would lead also to an overestimation of the interaction effect of feelings of guilt and greentech optimism on personal moral norm.

5.2.4 Concluding explanation of responsibility denial mechanism

If a critical level of dissonance is present in a situation in which an environmentally relevant decision has to be taken, greentech optimism will weaken the individual's belief that his/her own behavior is important for the solution of environmental problems (awareness of consequences), which in turn will result in a decrease of the individual's feelings of moral obligation to opt for the pro-environmental choice and in consequence in a neglect of the pro-environmental choice. At the same time, greentech optimism decreases the individual's estimation of the significance of the environmental problem (problem awareness), which also affects feelings of moral obligation in a negative way. However, as problem awareness and awareness of consequences are not entirely independent conceptually,

their influence on feelings of moral obligation is not additive in nature. Both are beliefs related to environmental problems and the solution of those problems. Although in the structural equation models greentech optimism did not exert additive indirect effects both via awareness of consequences and problem awareness, it has to be noted that greentech optimism also negatively affects the estimation of the problem size as well as the estimation of the importance of individual effort to contribute to the solution of environmental problems. Hence, greentech optimism weakens the motivation to show pro-environmental behavior via two of three expectations that guide motivation in the cognitive motivation model of Heckhausen (1977), namely, the behavior-result expectation (awareness of consequences) and the situation-result expectation (problem awareness) (cited in Rheinberg, 2000, p. 131).

Therefore, regarding pro-environmental decisions that are not easy to execute but bring about a critical level of behavioral costs, greentech optimism is expected to act as powerful psychological license for the denial of individual environmental responsibility. Or, in other words, greentech optimism represents a belief that can lead to vicarious licensing effects under the condition that behavioral costs hinder the easy execution of pro-environmental behavior. In reference to the energy saving, which from a 'engineering' point of view is expected to be achievable by the application of greentech, such vicarious licensing effects are expected to have their share in rebound effects on a societal level.

5.3 Limitations and issues for future research

5.3.1 Limitations

This dissertation contributes to the environmental research by introducing the new attitudinal concept greentech optimism and a reliable and valid scale for the measurement of greentech optimism and by providing valuable insights into processes of environmental responsibility denial due to greentech optimism. Nonetheless, as in any research process, in this dissertation, the findings have to be reflected against the background of possible limitations and biases.

Generalizability of the findings

The generalizability of the findings is limited, as both samples consisted of relatively young (and mostly female) persons with a high educational level. Especially the bias regarding the educational level is expected to be a possible threat to the external validity of the findings, as for the participants the comprehension of the questionnaire items may have been better than could be expected from a sample with an average level of education. The lower factor loadings of the two GTO scale items that referred to 'green technology', respectively to 'renewable energy' indicate that for future research, it would be advisable to skip these items, or to rephrase them, or to provide additional information about green technologies.

It has to be further reflected to which societies such a specific attitudinal concept like greentech optimism might be applicable in a reasonable fashion. The concept implies that green technologies enjoy a certain prevalence among the energy-producing and consuming technologies of a society. Additionally, greentech optimism can only be measured when some basic knowledge is prevalent among the population of a society and when a public discourse about the advantages and disadvantages of green technologies takes place. If such knowledge and discourse is lacking, persons are not expected to dispose of strong attitudes towards greentech. Thus, the concept of greentech optimism can contribute to the explanation of denial mechanisms regarding environmental responsibility in countries with a level of economic development comparable to OECD[23] countries.

Behavioral measure: forced choice as travel behavior

One important advantage of study II compared to study I was the extension of the models with a behavioral measure. Whereas in study I the behavior-inducing relevance of personal moral norm could only be estimated referring to the meta analyses by Bamberg and Möser (2007) and Hines et al. (1986/1987), in study II the behavior-inducing relevance could be confirmed statistically. Nonetheless, it has to be noted that the measure used in

[23] Organisation for Economic Co-operation and Development, http://www.oecd.org

study II consisted of the preference for participation in one of two lotteries. Although the travel vouchers that were raffled off were real, it could be argued that the forced choice for either a train voucher or an airline voucher does not represent a natural situation of travel mode or travel destination choice, hence compromising the external validity of the measure. Still, by controlling for bias in the choice due to the possession of a train travel card, the behavioral measure enjoys a high internal validity.

Cross-sectional data

The models of both studies rely on correlative relationships of cross-sectional data. Thus, true intra-individual processes are not described by the two studies, and the causality of the described relationships cannot be determined. Only a sound theoretical basis can help to draw assumptions on the causality. Study II intended to model a true-individual process by using a randomized treatment between two waves of data collection and by applying a two-wave change model (Raykov, 1992) in the structural equation modeling. As the treatment in study II did not result in the desired effects, there was no way of testing causality via intra-individual changes or via differences between the randomly assigned treatment group and control group. As consequence, hypothesis testing could only be carried out by way of modeling cross-sectional data. Nonetheless, as in-depth theoretical analyses preceded the structural equation modelling, and as the effect sizes of the hypothesized regression paths emanating from greentech optimism were generally high, it was possible to draw valid interpretations from the structural modeling process.

5.3.2 Future Research

The findings of this dissertation as well as its shortcomings and limitations point to a number of interesting paths for future research. Some of them will be outlined briefly in this section.

Validation and improvement of the GTO scale

Although the GTO scale as developed and tested in this dissertation proved to have good reliability and validity, it has to be further improved and evaluated. In this dissertation, the focus was on investigation of the behavioral relevance of a construct like greentech optimism. Convergent and divergent validity of the construct were not evaluated statistically. Future research projects could take up this task by comparing the GTO scale to constructs such as the general confidence scale (Siegrist et al., 2005) or the responsibility denial scale (Schwartz, 1968; Schwartz & Howard, 1980).

Further, it could be investigated whether GTO scale items of a general nature, like the ones referring to 'green technology', respectively to 'renewable energy', should be applied to samples with an average educational level.

Greentech optimism in a representative sample

As both studies of this dissertation do not dispose of representative samples, no conclusions could be drawn regarding the distribution of greentech optimism in the Swiss population. To be able to even roughly estimate possible rebound effects for which greentech optimism is accountable, such insights are vital. A short study among a representative sample in one or several OECD countries would be very beneficial. It would make sense to measure also socio-demographic variables, which could be of use for tailored communication measures.

Greentech optimism as a dependent variable

Greentech optimism was treated in this dissertation as a belief, and in the models it was incorporated as independent variable, respectively as moderator. In future studies it would be interesting to investigate how the belief 'greentech optimism' is dependent on media exposure, public policy, and advertising. The research could be carried out in a qualitative fashion (e.g., focus groups) and explore the semantic associations among entities like climate change, technology, media, policy, and advertising. Another research framework could include an experimental media treatment procedure that tries to manipulate greentech optimism.

Further theoretical and empirical work on cognitive dissonance

The unsuccessful induction of dissonance in study II led to the conclusion that cognitive dissonance is a somewhat fuzzy concept and that different forms of cognitive dissonance exist. At the same time, it was concluded that a critical level of dissonance has to be exceeded for the responsibility denial mechanism to occur. Thus, further theoretical and empirical work on the categorization of different forms of dissonance as well as on ways of how different forms of cognitive dissonance can be experimentally induced seems to be very promising.

As the comparison of the results from study I and II suggested that regarding the average dissonance levels and their variances there might be differences between the two behavioral fields, it would be interesting to further investigate this suggestion. A direct quantitative comparison of the dissonance levels between study I and study II would not have been an adequate strategy, as the comparison would have incorporated different behavioral fields and different samples at the same time. If a dissonance measure valid for different behavioral fields was developed, then it would be very interesting to use the same sample for the measurement of dissonance regarding different fields of behavior.

5.4 Practical implications (Research goal 5)

Green technologies are currently playing and will play in future a vital role in the efforts to mitigate global environmental problems. The research on greentech and the dissemination of greentech for production processes and for every day practices need unconditional support by policy makers and the society as a whole. However, following an efficiency strategy alone cannot be expected to lead to sustainability. The value of leading sufficient lifestyles needs to be supported to the same extent. If not, negative greentech optimism effects are likely to occur in behavioral fields where pro-environmental behavior is related to high behavioral (or symbolic) costs (e.g., mobility or vacation travel).

Negative greentech optimism effects complement the rebound effects emanating from greentech users themselves. In contrast to these rebound effects, negative greentech optimism effects are not dependent on actual greentech use but dependent on attitudes regarding greentech and on communication and discourse regarding greentech. Hence, any person exposed to communication on greentech (by media, advertising, or policy makers) may potentially be susceptible to responsibility denial processes due to greentech optimism.

Previous findings as well as the findings of this dissertation lead to the conclusion that behavioral costs related to pro-environmental behavior undermine people's good intentions to act in environmentally responsible ways. Any justification for the neglect of individual pro-environmental behavior is therefore seized upon thankfully. Optimism towards the problem-solving capacity of greentech represents a handy justification for the denial of personal responsibility. Hence, in behavioral decisions where pro-environmental behavior is related to high behavioral costs, this optimism facilitates neglect of the pro-environmental choice.

As the responsibility denial processes described are dependent on beliefs (regarding greentech), adequate strategies to circumvent responsibility denial should rely mainly on communication measures. Greentech should generally not be presented by policy makers, media, and advertisers as a panacea for the solution of environmental problems. It is important that communication on greentech incorporates the message that responsibility for environmental protection cannot be shifted towards policy makers or technology.

Communication measures by policy makers could elaborate such messages, and agreements with media and advertisers could secure their further dissemination. Specific messages could incorporate the explanation of rebound effects or generally refer to the benefits of a sufficient lifestyle for the individual (e.g., the health benefits of walking or bicycling instead of driving short distances). By constantly combining communication on greentech with the concept of sufficiency, associations between the mental representations of greentech and sufficiency could be created, which may lead to the effect that greentech

could act as a reminder of the importance of leading sufficient lifestyles.

The finding that the level of cognitive dissonance moderates the responsibility denial process points to the following policy strategy: Behavioral costs of pro-environmental behavior should be reduced. By reducing the costs, the pro-environmental choice does lead to less dissonance, hence does not give greentech optimism (or other justifications for non-action) a chance to step in.

A further issue that has to be addressed is the unjustified labeling of new technology as 'green' technology. The extent to which a technology can be considered 'green' depends on the benchmark to which the technology is compared. A comparison to a technological state of the art in the past will label any new technology with gain in efficiency as greentech. In contrast, the same new technology could be labeled 'not green enough' if compared to a benchmark set as a normative goal. The following example of the efficiency gains reached by the car industry will illustrate this notion. The average fuel consumption of new cars in Switzerland decreased from 8.95 liters per 100 kms in 1996 to 7.14 liters in 2008, which amounts to a reduction of 20.2%[24]. Hence, in the historical comparison the actual state of the art appears to be "greentech". However, compared to the normative goal of 6.4 liters, which Auto-Schweiz[25] and the DETEC[26] had agreed upon to be reached by 2008, the actual state of the art cannot be labeled green technology, as it missed the goal by 11.6 %. A benchmark referring to out of date technology (e.g., fuel consumption of cars in the past) is irrational, as the technology development in the past did not focus on energy conservation to the same extent as the actual global situation requires for the actual technology. The benchmark should be related to what the environment is able to sustain, and not what the environment had to bear in the past. A normative benchmark for a sustainable energy use per person has been defined by the project Novatlantis[27] (at the Swiss Federal Institute of Technology). They postulated the goal of decreasing the average continuous primary energy requirement per person from (in Switzerland) 6,000 watts now to 2,000 watts in the year 2100. Sticking to normative goals like the one mentioned may decrease unjustified labelling of technology as "greentech" and in turn may help attenuate negative greentech optimism effects.

If future environmental policies keep relying on efficiency measures alone, rebound effects and negative greentech optimism effects will always impede environmental goals to be reached. In the long term, it is therefore indispensable to establish a public discourse on values and world views. The technocentric world view (see section 2) with its disproportionate belief in economic growth and technological solutions has to be critically questioned, while the public discourse has be opened for ideas related to a more ecocen-

[24] www.auto-schweiz.ch
[25] Association of Swiss Automobile Importers
[26] Swiss Federal Department of the Environment, Transport, Energy and Communications
[27] www.novatlantis.ch

tric world view. Thereby, the adoption of sufficient lifestyles and its possible benefits for the individual's quality of life should be focused on.

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Appendices

A Covariance and correlation matrices

Table 21: Covariance matrix of the latent constructs of study I

	GTO	PMN	PA	AC	FG
GTO	0.603				
PMN	0.165	0.690			
PA	0.113	0.361	0.813		
AC	0.192	0.503	0.621	0.864	
FG	0.233	0.073	0.047	0.078	0.944

Table 22: Correlation matrix of the latent constructs of study I

	GTO	PMN	PA	AC	FG
GTO	1.000				
PMN	0.255	1.000			
PA	0.162	0.482	1.000		
AC	0.265	0.652	0.740	1.000	
FG	0.308	0.090	0.054	0.086	1.000

Table 23: Covariance matrix of the latent constructs of study II - wave 2

	GTO	PMN	PA	AC	Card	Behavior	FG
GTO	0.760						
PMN	-0.398	1.524					
PA	-0.369	0.568	0.772				
AC	-0.281	0.794	0.543	0.980			
Trav-Card	-0.036	-0.080	0.014	-0.081	0.156		
Behavior	-0.123	0.661	0.208	0.379	-0.167	1.000	
FG	-0.343	0.221	0.214	0.168	0.006	0.079	1.079

Table 24: Correlation matrix of the latent constructs of study II - wave 2

	GTO	PMN	PA	AC	Card	Behavior	FG
GTO	1.000						
PMN	-0.370	1.000					
PA	-0.482	0.524	1.000				
AC	-0.326	0.650	0.625	1.000			
Trav-Card	-0.104	-0.164	0.040	-0.207	1.000		
Behavior	-0.141	0.535	0.237	0.383	0.423	1.000	
FG	-0.421	0.171	0.235	0.163	0.016	0.006	1.000

B Descriptives tables from study II

B.1 Greentech optimism at wave 1

Table 25: Items of greentech optimism at wave 1 including their means, standard deviations and standardized factor loadings (N = 169)

Items per scale		M (SD)	β
Greentech optimism (6-point Likert scale)			
GTO_1	It makes me feel optimistic about our environment when I think of the developments being made in the field of green technologies.	4.17 (1.062)	.214
GTO_2	Thanks to the constant development of green technologies our great-grandchildren will still live on a healthy Earth.	3.25 (1.024)	.587
GTO_3	I'm very optimistic about our environment, because the application of renewable energies (sun, wind, biogas, geothermal energy) is constantly being extended.	3.46 (1.024)	.570
GTO_4	Thanks to the fostering of renewable energies (sun, wind, biogas, geothermal energy) our great-grandchildren will still live on a healthy Earth.	3.22 (0.986)	.609
GTO_5	As more and more energy-efficient appliances for the household and for everyday life are getting on the market, I'm relaxed about our future.	3.08 (1.032)	.647
GTO_6	The environmental problem will become less important, because appliances for the household and for everyday life are becoming less and less energy consuming.	2.46 (0.964)	.799
GTO_7	It makes me feel optimistic about our environment when I see how the vehicle fleets of public transport are becoming increasingly environmentally friendly.	3.70 (1.083)	.446
GTO_8	Because the vehicle fleets of public transport are becoming increasingly environmentally friendly, the environmental problem will become less and less important.	2.50 (1.030)	.822
GTO_9	As our cars are becoming more and more increasingly environmentally friendly, I'm relaxed about our future.	2.86 (1.102)	.758
GTO_{10}	Environmental problems will decrease, as our cars use less and less fuel.	2.42 (1.015)	.865
GTO_{11}	I'm very optimistic about our environment as new developed airplanes use less and less fuel.	2.92 (0.976)	.706
GTO_{12}	The environmental problem will become less important, because airplanes use less and less fuel.	2.27 (1.034)	.858

B.2 Greentech optimism at wave 2

Table 26: Items of greentech optimism at wave 2 including their means, standard deviations and standardized factor loadings (N = 169)

Items per scale		M (SD)	β
Greentech optimism (6-point Likert scale)			
GTO_1	It makes me feel optimistic about our environment when I think of the developments being made in the field of green technologies.	3.82 (1.067)	.363
GTO_2	Thanks to the constant development of green technologies our great-grandchildren will still live on a healthy Earth.	3.06 (1.039)	.604
GTO_3	I'm very optimistic about our environment, because the application of renewable energies (sun, wind, biogas, geothermal energy) is constantly being extended.	3.37 (1.021)	.607
GTO_4	Thanks to the fostering of renewable energies (sun, wind, biogas, geothermal energy) our great-grandchildren will still live on a healthy Earth.	3.18 (1.033)	.639
GTO_5	As more and more energy-efficient appliances for the household and for everyday life are getting on the market, I'm relaxed about our future.	2.87 (0.955)	.746
GTO_6	The environmental problem will become less important, because appliances for the household and for everyday life are becoming less and less energy consuming.	2.44 (0.975)	.770
GTO_7	It makes me feel optimistic about our environment when I see how the vehicle fleets of public transport are becoming increasingly environmentally friendly.	3.30 (1.106)	.583
GTO_8	Because the vehicle fleets of public transport are becoming increasingly environmentally friendly, the environmental problem will become less and less important.	2.54 (1.029)	.774
GTO_9	As our cars are becoming more and more increasingly environmentally friendly, I'm relaxed about our future.	2.65 (1.059)	.832
GTO_{10}	Environmental problems will decrease, as our cars use less and less fuel.	2.43 (1.039)	.856
GTO_{11}	I'm very optimistic about our environment as new developed airplanes use less and less fuel.	2.65 (1.042)	.748
GTO_{12}	The environmental problem will become less important, because airplanes use less and less fuel.	2.36 (0.984)	.799

B.3 Personal moral norm at wave 1

Table 27: Items of personal moral norm at wave 1 including their means, standard deviations and standardized factor loadings (N = 169)

Items per scale		M (SD)	β
Personal moral norm (6-point Likert scale)			
PMN_1	Feelings of moral obligation to avoid long-haul flights on summer vacation.	2.66 (1.393)	.578
PMN_2	Feelings of moral obligation to choose to travel by train, when traveling to Vienna.	3.98 (1.573)	.839
PMN_3	Feelings of moral obligation to choose to travel by train, when traveling to Rome.	3.59 (1.624)	.854
PMN_4	Feelings of moral obligation to choose to travel by train, when traveling to Berlin.	3.64 (1.575)	.888
PMN_5	Feelings of moral obligation to choose to travel by train, when traveling to Paris.	4.38 (1.618)	.725
PMN_6	Feelings of moral obligation to choose to travel by train, when traveling to Barcelona	2.76 (1.509)	.731
PMN_7	Feelings of moral obligation to choose to travel by train, when traveling to Amsterdam.	3.34 (1.584)	.805

B.4 Personal moral norm at wave 2

Table 28: Items of personal moral norm at wave 2 including their means, standard deviations and standardized factor loadings (N = 169)

Items per scale		M (SD)	β
Personal moral norm (6-point Likert scale)			
PMN_1	Feelings of moral obligation to avoid long-haul flights on summer vacation	2.98 (1.347)	.765
PMN_2	Feelings of moral obligation to choose to travel by train, when traveling to Vienna.	4.04 (1.477)	.826
PMN_3	Feelings of moral obligation to choose to travel by train, when traveling to Rome.	3.69 (1.555)	.839
PMN_4	Feelings of moral obligation to choose to travel by train, when traveling to Berlin.	3.68 (1.494)	.819
PMN_5	Feelings of moral obligation to choose to travel by train, when traveling to Paris.	4.54 (1.476)	.681
PMN_6	Feelings of moral obligation to choose to travel by train, when traveling to Barcelona	2.70 (1.365)	.749
PMN_7	Feelings of moral obligation to choose to travel by train, when traveling to Amsterdam.	3.31 (1.464)	.828

B.5 Measures of dissonance

Table 29: Items of feelings of guilt 'Proxy' at wave 1 including their means, standard deviations and standardized factor loadings (N = 169)

Items per scale		M (SD)	β
Feelings of guilt 'Proxy' (6-point Likert scale)			
FG_1	With a clear conscience I can say that I do my share for environmental protection (recoded).	4.01 (0.876)	1
FG_2	If everybody behaved as I do, our environment would be in a considerably better condition (recoded).	3.87 (0.955)	.606

Table 30: Items of feelings of guilt 'Proxy' at wave 2 including their means, standard deviations and standardized factor loadings (N = 169)

Items per scale		M (SD)	β
Feelings of guilt 'Proxy' (6-point Likert scale)			
FG_1	With a clear conscience I can say that I do my share for environmental protection (recoded).	3.95 (0.953)	1
FG_2	If everybody behaved as I do, our environment would be in a considerably better condition (recoded).	3.86 (0.976)	.703

Table 31: Items of feelings of guilt at wave 2 including their means, standard deviations and standardized factor loadings (N = 169)

Items per scale		M (SD)	β
Feelings of guilt (6-point Likert scale)			
FG_3	I have a bad conscience about the environment, when I think of my travel behavior.	2.96 (1.244)	1
FG_4	I have a bad feeling, when I think of how often I travel by airplane.	2.76 (1.278)	.789

Table 32: Items of feelings of hypocrisy at wave 2 including their means, standard deviations and standardized factor loadings (N = 169)

Items per scale		M (SD)	β
Feelings of hypocrisy (6-point Likert scale)			
FH_1	Sometimes I have the feeling that I'm actually less pro-environmental than I pretend to be.	3.17 (1.062)	.819
FH_2	Sometimes I'm a bit uncertain about how pro-environmental I really am.	3.54 (1.069)	.748
FH_3	When I think about my travel behavior, I may not be as pro-environmental as I thought.	3.72 (1.263)	.416

C Questionnaires

C.1 Questionnaire study I

Liebe Teilnehmerin, lieber Teilnehmer!

Danke, dass Sie sich Zeit nehmen, an dieser Studie teilzunehmen.

Die Studie wird in **Kooperation von der Fakultät für Psychologie der Universität Wien und vom Psychologischen Institut der Universität Zürich** durchgeführt.

In dieser Studie werden Fragen zu Ihrer **Einstellung bezüglich Stromsparen** gestellt. Sie dauert in etwa 20 Minuten. Selbstverständlich sind Ihre Angaben vollkommen anonym und werden nur zu wissenschaftlichen Zwecken verwendet.

Bei Rückfragen oder Problemen stehe wir gerne unter folgender E-Mail-Adresse zur Verfügung: strom_studie@psychologie.uzh.ch

Vielen Dank für Ihre Unterstützung!

Katharina Weber (Universität Wien) & Martin Soland (Universität Zürich)

Weiter

Seite 02

1. Haben Sie an dieser Untersuchung schon einmal teilgenommen? [A001]

- Ja
- Nein

Seite 03

PHP-Code

```
if (value('A001') > 1) {
// Springe direkt weiter zu Seite 4
goToPage('Einleitung');
}
```

Danke, dass Sie an dieser Studie bereits Teilgenommen haben.
Wir möchten uns herzlich für Ihre Mithilfe an der Studie bedanken. Es ist für die Richtigkeit der Resultate wichtig, dass jede Person nur einmal an der Studie teilnimmt.

Weiter

Seite 04

PHP-Code

```
if (value('A001') < 2) {
// Springe direkt weiter zu Seite 17
goToPage('Danke');
}
```

Um das **Verständnis des Fragebogens zu erleichtern**, sind hier drei Definitionen von häufig verwendeten Begriffen angeführt:

• **Grüne Technologien:**

Grüne Technologien ist jene Technologien, die auf dem neuesten und umweltschonendsten Stand der Technik sind. Die Grüne Technologien versucht, die allgemein zur Verfügung stehenden Ressourcen effizienter zu nutzen und die Umwelt so wenig wie möglich zu belasten. (z.B.: Windkraft, Wasserkraft, Hybridautos, stromsparende Haushaltsgeräte uvm.)

• **Standby-Strom:**

Standby-Strom bezeichnet jenen Stromverbrauch, der entsteht, wenn zum Beispiel Ihr Fernseher oder Computer nicht ganz ausgeschaltet ist, sondern sozusagen im Bereitschaftsbetrieb steht.

• **Klimawandel:**

Unter dem Begriff Klimawandel wird allgemein die überdurchschnittliche Erwärmung des Erdklimas in den letzten Jahren verstanden. Man geht allgemein davon aus, dass der Mensch wesentlich zu dieser Erwärmung beiträgt.

1. Im Folgenden finden Sie unterschiedliche Aussagen zum Thema Stromsparverhalten im Haushalt. Geben Sie bitte an, wie sehr diese Aussagen für Sie zutreffen. [PN01]

Die Antwortskala reicht von „trifft überhaupt nicht zu“ bis „trifft voll und ganz zu“ (1 bis 5).

	trifft überhaupt nicht zu		trifft teilweise zu		trifft voll und ganz zu	kann ich nicht beantworten
	1	2	3	4	5	
Ich fühle mich persönlich aus Umweltschutzgründen dazu verpflichtet, im Leben sparsam mit Energie umzugehen.	○	○	○	○	○	○
Ich fühle mich persönlich aus Umweltschutzgründen dazu verpflichtet, meine Wäsche mit möglichst niedriger Temperatur zu waschen.	○	○	○	○	○	○
Ich fühle mich persönlich dafür verantwortlich, Geräte immer ganz auszuschalten und nicht im Standby-Modus zu belassen.	○	○	○	○	○	○
Ich fühle mich persönlich aus Umweltschutzgründen dazu verpflichtet, in Räumen das Licht auszuschalten, in denen es nicht benötigt wird.	○	○	○	○	○	○
Ich halte es persönlich für meine Pflicht, meine Wäsche an der Luft und nicht mit dem Wäschetrockner zu trocknen.	○	○	○	○	○	○
Ich fühle mich persönlich aus Umweltschutzgründen dazu verpflichtet, generell im Haushalt Strom zu sparen.	○	○	○	○	○	○

Frage [OS02]

	trifft überhaupt nicht zu		trifft teilweise zu		trifft voll und ganz zu	kann ich nicht beantworten
	1	2	3	4	5	
Wenn ich meine Wäsche im Trockner anstatt an der Luft getrocknet habe, stellt sich bei mir ein schlechtes Gewissen gegenüber der Umwelt ein.	○	○	○	○	○	○
Ich habe keine Schuldgefühle, wenn ich meine Wäsche mit höheren Temperaturen als nötig wasche.	○	○	○	○	○	○

Wenn Geräte im Standby-Strom laufen, mache ich mir Sorgen um den Energieverbrauch und der damit einhergehenden Umweltbelastung.	○	○	○	○	○	○
Ich habe ein Schuldgefühl gegenüber der Umwelt, wenn ich unbenötigte Lichtquellen brennen lasse.	○	○	○	○	○	○

Weiter

Seite 06

Der nächste Abschnitt bezieht sich auf Personen, die Ihnen besonders nahe stehen oder auf deren Meinung Sie großen Wert legen.

1. Wie glauben diese Personen, dass Sie sich verhalten sollten?

Bitte nennen Sie drei Personen (Person A, Person B, Person C), die Ihnen Ihrer Meinung nach sehr nahe stehen: [SN01]

(Sie brauchen die konkreten Namen der Person nicht zu nennen. Die Angabe „Vater“, „Mutter“, „Tochter“, „Freund“, „Arbeitskollegin“, etc. ist ausreichend.)

Person A

Frage [SN04]

	trifft überhaupt nicht zu		trifft teilweise zu		trifft voll und ganz zu	kann ich nicht beantworten
	1	2	3	4	5	
Person A meint, dass Sie die Wäsche immer mit möglichst niedriger Temperatur waschen sollten.	○	○	○	○	○	○
Person A meint, dass Sie generell im Haushalt Strom sparen sollten.	○	○	○	○	○	○
Person A meint, dass Sie generell im Leben Energie sparen sollten.	○	○	○	○	○	○
Person A meint, dass Sie die Wäsche an der Luft trocknen lassen sollten, anstatt sie mit dem Wäschetrockner zu trocknen.	○	○	○	○	○	○
Person A meint, dass Sie in Räumen, in denen Sie sich nicht aufhalten, das Licht ausschalten sollten.	○	○	○	○	○	○
Person A meint, dass Sie die Geräte immer ganz ausschalten und nicht im Standby-Modus belassen sollten.	○	○	○	○	○	○

Frage [SN02]

Person B

Frage [SN05]

	trifft überhaupt nicht zu		trifft teilweise zu		trifft voll und ganz zu	kann ich nicht beantworten
	1	2	3	4	5	
Person B meint, dass Sie generell im Haushalt Strom sparen sollten.	○	○	○	○	○	○
Person B meint, dass Sie generell im Leben Energie sparen sollten.	○	○	○	○	○	○
Person B meint, dass Sie in Räumen, in denen Sie sich nicht aufhalten, das Licht ausschalten sollten.	○	○	○	○	○	○
Person B meint, dass Sie die Wäsche immer mit möglichst niedriger Temperatur waschen sollten.	○	○	○	○	○	○
Person B meint, dass Sie die Wäsche an der Luft trocknen lassen sollten, anstatt sie mit dem Wäschetrockner zu trocknen.	○	○	○	○	○	○
Person B meint, dass Sie die Geräte immer ganz ausschalten und nicht im Standby-Modus belassen sollten.	○	○	○	○	○	○

Weiter

Seite 07

Frage [SN03]

Person C

Frage [SN06]

	trifft überhaupt nicht zu		trifft teilweise zu		trifft voll und ganz zu	kann ich nicht beantworten
	1	2	3	4	5	
Person C meint, dass Sie die Wäsche immer mit möglichst niedriger Temperatur waschen sollten.	○	○	○	○	○	○
Person C meint, dass Sie die Wäsche an der Luft trocknen lassen sollten, anstatt sie mit dem Wäschetrockner zu trocknen.	○	○	○	○	○	○

Person C meint, dass Sie in Räumen, in denen Sie sich nicht aufhalten, das Licht ausschalten sollten.	○	○	○	○	○	○
Person C meint, dass Sie generell im Leben Energie sparen sollten.	○	○	○	○	○	○
Person C meint, dass Sie generell im Haushalt Strom sparen sollten.	○	○	○	○	○	○
Person C meint, dass Sie die Geräte immer ganz ausschalten und nicht im Standby-Modus belassen sollten.	○	○	○	○	○	○

Weiter

Seite 08

1. Manchmal würde man gerne eine Handlung ausführen, aber man kann dies aufgrund der gegebenen Umstände nicht. Wie sieht das bei Ihnen bei den folgenden Handlungen aus? [WV01]

Wie schwer oder leicht fallen Ihnen folgende Handlungen?

	schwer		mittel		leicht	kann ich nicht beantworten
	1	2	3	4	5	
Im Leben generell Energie zu sparen ist für mich ...	○	○	○	○	○	○
Generell im Haushalt Strom zu sparen ist für mich ...	○	○	○	○	○	○
Geräte ganz auszuschalten und diese nicht im Standby-Strom laufen zu lassen, ist für mich ...	○	○	○	○	○	○
Die Waschmaschine mit der tiefsten möglichen Temperatur laufen zu lassen, ist für mich ...	○	○	○	○	○	○

Weiter

Seite 09

1. Bitte kreuzen Sie auf einer Skala von „stimme überhaupt nicht zu“ bis „stimme voll und ganz zu“ (1 bis 5) an, inwiefern Sie folgenden Aussagen zustimmen. [PW01]

	stimme überhaupt nicht zu		stimme teilweise zu		stimme voll und ganz zu	kann ich nicht beantworten

	1	2	3	4	5	
Der Stromverbrauch in Privathaushalten trägt wesentlich zur Bedrohung der natürlichen Umwelt bei.	○	○	○	○	○	○
Der ansteigende Stromverbrauch im privaten Bereich stellt ein ernstzunehmendes Problem für die Umwelt dar.	○	○	○	○	○	○
Der Anteil des privaten Energieverbrauches an der Umweltzerstörung wird von den Medien unnötig hochgespielt.	○	○	○	○	○	○
Der hohe Stromverbrauch in privaten Haushalten trägt wesentlich zum Klimawandel bei.	○	○	○	○	○	○

Frage [BH01]

	stimme überhaupt nicht zu		stimme teilweise zu		stimme voll und ganz zu	kann ich nicht beantworten
	1	2	3	4	5	
Ich bin mir dessen bewusst, dass mein privates Energiesparverhalten einen Einfluss auf den Klimawandel hat.	○	○	○	○	○	○
Durch das konsequente Ausschalten unnötiger Lichtquellen kann ich einen entscheidenden Beitrag zum Umweltschutz leisten.	○	○	○	○	○	○
Ich glaube, dass ich durch Vermeiden von Standby-Strom einen Beitrag zum Umweltschutz leisten kann.	○	○	○	○	○	○
Durch das Trocknen von Wäsche an der Luft (anstatt im Wäschetrockner), kann ich einen Beitrag zum Schutz unserer Umwelt leisten.	○	○	○	○	○	○
Ich kann durch ein umweltschonendes Energieverhalten einen Beitrag zum Umweltschutz leisten.	○	○	○	○	○	○

Frage [SV01]

	stimme überhaupt nicht zu		stimme teilweise zu		stimme voll und ganz zu	kann ich nicht beantworten
	1	2	3	4	5	

In den Medien erfährt man viel darüber, wie man persönlich im Haushalt Strom sparen kann.	○	○	○	○	○	○
In den Medien erfährt man viel darüber, wie man im Leben generell Energie sparen kann.	○	○	○	○	○	○

Weiter

Seite 10

Im Folgenden finden Sie unterschiedliche Fragen zu Ihrer **persönlichen Mediennutzung**. Bitte denken Sie hierbei nicht zu lange nach, und antworten Sie möglichst spontan.

Als Beispiel: Wenn Sie 50 Minuten pro Tag fernsehen, dann tragen Sie bitte 0 Stunden und 50 Minuten ein. Sollten Sie 80 Minuten pro Tag fernsehen, geben Sie bitte 1 Stunde und 20 Minuten an. Falls Sie gar nicht fernsehen geben Sie bitte in 0 Stunden und 0 Minuten an.

1. Wie lange sehen Sie pro Tag durchschnittlich fern? [AM01]

_____ Stunden und _____ Minuten

2. Wie lange hören Sie pro Tag durchschnittlich Radio? [AM02]

_____ Stunden und _____ Minuten

3. Wie lange nutzen Sie pro Tag durchschnittlich privat das Internet? [AM03]

(inklusive Mail)

_____ Stunden und _____ Minuten

4. Wie lange lesen Sie pro Tag durchschnittlich Zeitung? [AM04]

(auch Online-Ausgabe von Zeitungen)

_____ Stunden und _____ Minuten

5. Wie oft hören bzw. sehen Sie bewusst Nachrichten im Radio bzw. Fernsehen? [AM05]

- ○ nie
- ○ selten
- ○ oft

- täglich
- mehrmals täglich

Weiter

Seite 11

1. Im Folgenden werden Sie gebeten, zu einigen Aussagen zum Thema Grüne Technologie Ihre Meinung zu äußern. Bitte geben Sie an, wie sehr oder wenig Sie den folgenden Aussagen zustimmen. [GT01]

Versuchen Sie bitte möglichst spontan zu antworten.

	stimme überhaupt nicht zu		stimme teilweise zu		stimme voll und ganz zu	kann ich nicht beantworten
	1	2	3	4	5	
Weil erneuerbare Energiequellen immer besser nutzbar gemacht werden, sind wir auf gutem Wege, den Klimawandel stoppen zu können.						
Es stimmt mich optimistisch für unsere Umwelt, wenn ich sehe, wie der Ausbau erneuerbarer Energiequellen voranschreitet.						
Trotz der Entwicklung energieeffizienter Haushaltsgeräte werden wir den Klimawandel nicht in den Griff bekommen.						
Es stimmt mich optimistisch für unsere Umwelt, wenn ich sehe, wie die Entwicklung Grüner Technologien voranschreitet.						
Durch den Einsatz immer effizienterer Haushaltsgeräte (Kühlschrank, Waschmaschine, etc.) können wir den Klimaproblemen Herr werden.						
Auch durch die Weiterentwicklung Grüner Technologien werden wir den Klimawandel nicht aufhalten können						
Dank der stetigen Weiterentwicklung Grüner Technologien sind wir auf gutem Weg, den Klimawandel in den Griff zu bekommen.						

Weiter

1. Im Folgenden finden Sie unterschiedliche Aussagen zum Thema Umweltbewusstsein. [UB01]

Geben Sie bitte an, wie sehr Sie diese Aussagen für Sie zu treffen. Die Antwortskala reicht von **„trifft überhaupt nicht zu“** bis **„trifft voll und ganz zu“** (1 bis 5).

	stimme überhaupt nicht zu		stimme teilweise zu		stimme voll und ganz zu	kann ich nicht beantworten
Wenn Menschen in die Natur eingreifen, so hat das oft katastrophale Konsequenzen.	○	○	○	○	○	○
Menschen haben das Recht, die natürliche Umwelt zu verändern, um ihre Bedürfnisse zu stillen.	○	○	○	○	○	○
Die Erde ist wie ein Raumschiff mit sehr beschränktem Raum und Ressourcen.	○	○	○	○	○	○
Menschen sind dazu bestimmt, über den Rest der Natur zu bestimmen.	○	○	○	○	○	○
Menschen werden irgendwann einmal genügend darüber gelernt haben, wie die Natur funktioniert und in der Lage sein, diese zu kontrollieren.	○	○	○	○	○	○
Die Erde hat viele natürliche Ressourcen, wenn wir nur lernen diese zu entwickeln.	○	○	○	○	○	○
Das Gleichgewicht der Natur ist sehr empfindlich und leicht gestört.	○	○	○	○	○	○
Die sogenannte "Öko-Krise“, welche die Menschheit bedroht, wird stark überschätzt.	○	○	○	○	○	○
Das Gleichgewicht der Natur ist stark genug, um mit den Auswirkungen der modernen Industrie-Nationen fertig zu werden.	○	○	○	○	○	○
Wir erreichen bald die Grenze der Bevölkerungszahl, welche die Erde verkraften kann.	○	○	○	○	○	○
Trotz unserer speziellen Fähigkeiten sind wir Menschen immer noch den Gesetzen der Natur unterworfen.	○	○	○	○	○	○
Wenn die Dinge weiterhin so weitergehen wie jetzt, werden wir bald eine größere ökologische Katastrophe erleben.	○	○	○	○	○	○
Menschen überbeanspruchen die Umwelt in starkem Masse.	○	○	○	○	○	○
Pflanzen und Tiere haben das gleiche Recht zu existieren wie Menschen.	○	○	○	○	○	○
Der menschliche Einfallsreichtum wird sicherstellen, dass wir die Erde nicht unbewohnbar machen.	○	○	○	○	○	○

Weiter

Seite 13

1. Bitte geben Sie ihr Alter in Jahren an: [SD01]

(nur Zahlen)

Jahre

2. Geschlecht: [SD02]

- weiblich
- männlich

3. Welche Staatangehörigkeit haben Sie? [DM01]

- Schweiz
- Österreich
- Deutschland
- Sonstige

4. Wie ist Ihr derzeitiger Familienstand? [DM03]

- Alleinstehend
- In einer Beziehung
- Verheiratet
- Geschieden/Getrennt
- Verwitwet
- Sonstiger

5. Wie viele Personen leben in Ihrem Haushalt? [DM04]

(einschließlich Ihnen selbst)

Kinder und Erwachsene

6. Welchen Beruf üben Sie aus bzw. welcher Tätigkeit gehen Sie nach? [DM07]

- SchülerIn / StudentIn / Lehrling oder Auszubildende/r

- Angestellte/r
- selbständig oder freiberuflich tätig
- in Fort- oder Weiterbildung
- nicht erwerbstätig, auf Arbeitssuche
- in Mutterschutz/Karenz
- in Pension/Rente
- im Haushalt tätig
- Sonstiges

Weiter

Seite 14

PHP-Code

```
if (value('DM01') > 1) {
// Springe direkt weiter zu Seite 15
goToPage('Austria');
}
```

1. Ihre höchste abgeschlossene Ausbildung: [DM06]

- Obligatorische Schule (Primar-, Real-, Sekundar-, Bezirksschule)
- Berufslehre
- Maturität, Fachmittelschule (z.B. Handelsschule, BMS, DMS) oder Lehrkräfte-Seminarien (z.B. Kindergarten, Primarschule)
- Höhere Fachschule (z.B. eidg. Fachausweis, eidg. Fach- oder Meisterdiplom, TS)
- Universitäre Hochschule (z.B. ETH, Universität, HSG), Fachhochschule

2. Wie viel beträgt die ungefähre Summe des Brutto-Einkommens pro Monat aller im Haushalt lebenden Mitglieder? [DM09]

(Inklusive Renten und ohne Abzüge)

- unter 2000 CHF
- 2000 – 4000 CHF
- 4001 – 6000 CHF
- 6001 – 8000 CHF
- 8001 – 10´000 CHF
- 10´001 – 12´000 CHF
- 12´001 – 14´000 CHF
- mehr als 14´000 CHF
- ich weiss es nicht
- ich möchte hierzu keine Angaben machen

Weiter

Seite 15

PHP-Code

```
if (value('DM06') > 1) {
// Springe direkt weiter zu Seite 16
goToPage('Fragen');
}
```

1. Ihre höchste abgeschlossene Ausbildung: [DM05]

- Pflichtschule
- Lehre
- Matura / Abitur
- Kolleg / Meisterprüfung
- Hochschulabschluss / FH Abschluss

2. Wie viel beträgt die ungefähre Summe des Brutto-Einkommens pro Monat aller im Haushalt lebenden Mitglieder? [DM08]

(Inklusive Pension und ohne Abzüge)

- unter 1200 Euro
- 1200 – 2500 Euro
- 2500 – 3500 Euro
- 3500 – 4500 Euro
- 4500 – 5500 Euro
- 5500 – 7000 Euro
- 7000 – 9000 Euro
- über 9000 Euro
- ich weiß es nicht
- ich möchte hierzu keine Angaben machen

Weiter

Seite 16

1. Möchten Sie zu dieser Befragung noch etwas anmerken? [ZS01]

Wenn Ihnen während der Teilnahme an dieser Befragung etwas Negatives / Positives aufgefallen ist, wenn Fragen an einer Stelle nicht klar waren oder Ihnen die Beantwortung einiger Fragen unangenehm war – bitte schreiben Sie ein paar kurze Stichworte dazu.

Weiter

Seite 17

Danke für Ihre Teilnahme!

Wir möchten uns herzlich für Ihre Mithilfe an der Studie bedanken.

Wenn Sie uns etwas mitteilen möchten oder an den Studienresultaten interessiert sind, so können Sie uns über folgende E-Mail-Adresse erreichen: strom_studie@psychologie.uzh.ch

Sie können nun das Fenster schließen.

1. Wenn Sie Studierende/r am Psychologischen Institut der Universität Zürich sind klicken Sie bitte auf Ja. [PY01]

Sie haben soeben 1/2 Versuchspersonen-Stunden erreicht. Bitte drucken Sie sich die nächste Seite aus, füllen Sie das Formular aus und schicken es zusammen mit der Karte an unten stehende Adresse.

- Ja

Weiter

Seite 18

PHP-Code

```
if (value('PY01') < 1) {
// Springe direkt weiter zu Seite
goToPage('end');
}
```

1. Bitte füllen Sie das Formular aus: [PZ01]

Vorname

Frage [PZ02]

Nachname

Frage [PZ03]

Strasse / Nr.

Frage [PZ04]

PLZ / Ort

Frage [PZ05]

Matrikelnummer

Bitte drucken Sie diese Seite aus und schicken sie **zusammen mit Ihrer Versuchspersonenkarte** an folgende Adresse:

Universität Zürich
Psychologisches Institut
Sozialpsychologie
Vermerk: Strom Studie
Binzmühlestrasse 14 / Box 15
CH-8050 Zürich

Wir werden die Karte ausgefüllt und unterschrieben an Sie zurücksenden!

Weiter

Letzte Seite

Fenster schließen

C.2 Questionnaire study II - wave 1

Reisestudie Teil 1

Herzlich Willkommen zum ersten Teil der Reisestudie!

In der folgenden Umfrage (ca. 15 Minuten) werden Sie Fragen zu ihrem Freizeit- und Reiseverhalten beantworten.

Lesen Sie bitte jede Frage sorgfältig durch und antworten Sie möglichst spontan. Ihr erster Eindruck ist meist auch der treffendste. Ihre Antworten werden se bstverständlich anonym und vertraulich behandelt.

Wir danken Ihnen im Voraus herzlich für ihre Mitarbeit und wünschen Ihnen viel Vergnügen.

Diese Umfrage enthält 128 Fragen.

Einstieg Reisen 2010

In den ersten Frageblöcken bitten wir Sie nun, sich an Ihre **Ferien- und Freizeitreisen** zurückzuerinnern, welche Sie in den **Jahren 2010 und 2011** unternommen haben.

1 [fb1_ReJN]Ihre Reisen im Jahre 2010

Haben Sie im Jahre 2010 eine oder mehrere Reisen ins Ausland gemacht?

Bitte berücksichtigen Sie alle Reisen, bei welchen Sie mindestens 2 Nächte auswärts verbracht haben.

*

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Ja
- ○ Nein

Jahr 2010; Reise 1

2010: Ausland-Reise 1

2 [fb1_Re1Ja10Intro]Bitte beschreiben Sie uns die erste Reise, welche Sie im Jahre 2010 unternommen haben an Hand der nun folgenden Fragen. *

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war 'Ja' bei Frage '1 [fb1_ReJN]' (Ihre Reisen im Jahre 2010 Haben Sie im Jahre 2010 eine oder mehrere Reisen ins Ausland gemacht? Bitte berücksichtigen Sie alle Reisen, bei welchen Sie mindestens 2 Nächte auswärts verbracht haben.)

3 [fb1_Re1Ja10L]In welchem Land befindet sich die Reisedestination?

(Bei mehreren Ländern einfach dasjenige Land angeben, in welchem Sie die meiste Zeit verbracht haben.)
***

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war 'Ja' oder 'Ja' bei Frage '1 [fb1_ReJN]' (Ihre Reisen im Jahre 2010 Haben Sie im Jahre 2010 eine oder mehrere Reisen ins Ausland gemacht? Bitte berücksichtigen Sie alle Reisen, bei welchen Sie mindestens 2 Nächte auswärts verbracht haben.)

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Ägypten
- ○ Äquatorialguinea
- ○ Äthiopien
- ○ Afghanistan
- ○ Albanien
- ○ Algerien
- ○ Andorra
- ○ Angola
- ○ Antigua und Barbuda
- ○ Argentinien
- ○ Armenien
- ○ Aserbaidschan
- ○ Australien
- ○ Bahamas
- ○ Bahrain
- ○ Bangladesch
- ○ Barbados
- ○ Belarus
- ○ Belgien
- ○ Belize
- ○ Benin
- ○ Bhutan
- ○ Bolivien
- ○ Bosnien und Herzegowina
- ○ Botsuana
- ○ Brasilien

4 [fb1_Re1Ja10D]Wie heisst die Ortschaft resp. Region, in welcher Sie während der Reise die meiste Zeit verbrachten? *

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war 'Ja' oder 'Ja' bei Frage '1 [fb1_ReJN]' (Ihre Reisen im Jahre 2010 Haben Sie im Jahre 2010 eine oder mehrere Reisen ins Ausland gemacht? Bitte berücksichtigen Sie alle Reisen, bei welchen Sie mindestens 2 Nächte auswärts verbracht haben.)

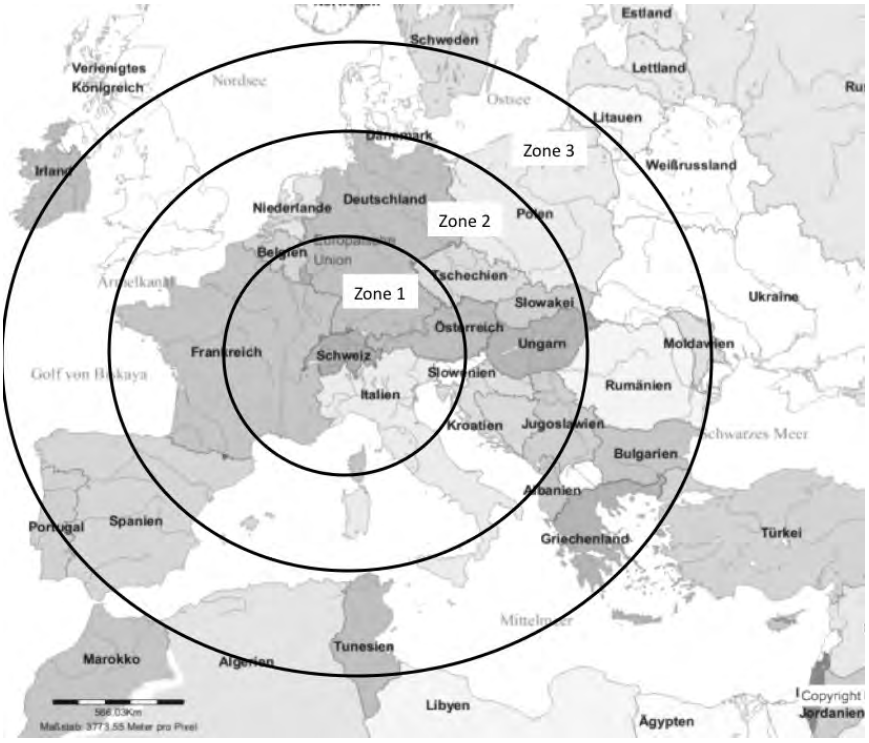
Bitte geben Sie Ihre Antwort(en) hier ein:

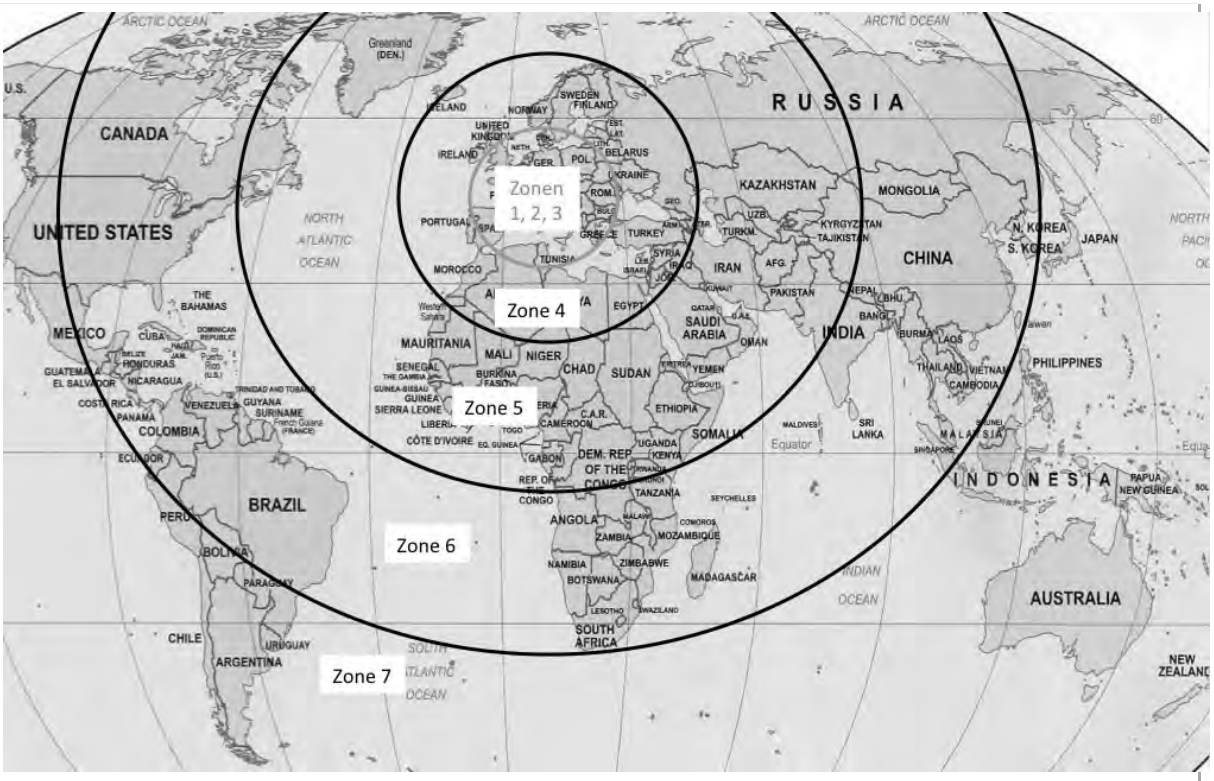
Ortsbezeichnung

5 [fb1_Re1Ja10Zo]Nachfolgend sehen Sie eine Europakarte und eine Weltkarte. Diese haben wir in Zonen eingeteilt, welche durch konzentrische Kreise begrenzt sind.

Bitte geben Sie nun an, in welcher Zone sich Ihre Reisedestination befindet.

(Beispiele: Mailand befindet sich in Zone 1, Sizilien befindet sich in Zone 3, Israel in Zone 4, Australien in Zone 7)





*

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war 'Ja' bei Frage '1 [fb1_ReJN]' (Ihre Reisen im Jahre 2010 Haben Sie im Jahre 2010 eine oder mehrere Reisen ins Ausland gemacht? Bitte berücksichtigen Sie alle Reisen, bei welchen Sie mindestens 2 Nächte auswärts verbracht haben.)

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Zone 1
- ○ Zone 2
- ○ Zone 3
- ○ Zone 4
- ○ Zone 5
- ○ Zone 6
- ○ Zone 7

6 [fb1_Re1Ja10Tr]Mit welchem Transportmittel sind Sie angereist?
Bitte geben Sie dasjenige Transportmittel an, mit welchem Sie die grösste Distanz zurückgelegt haben.
*

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war 'Ja' bei Frage '1 [fb1_ReJN]' (Ihre Reisen im Jahre 2010 Haben Sie im Jahre 2010 eine oder mehrere Reisen ins Ausland gemacht? Bitte berücksichtigen Sie alle Reisen, bei welchen Sie mindestens 2 Nächte auswärts verbracht haben.)

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Eisenbahn
- ○ Auto/Motorrad
- ○ Reisebus
- ○ Flugzeug
- ○ Schiff/Fähre

- ○ Eisenbahn und Fähre
- ○ Auto/Motorrad und Fähre
- ○ Reisebus und Fähre
- ○ Fahrrad
- ○ Zu Fuss
- ○ Sonstiges

7 [fb1_Re1Ja10A]Wie lange dauerte die Anreise mit diesem Transportmittel? Bitte geben Sie die Dauer in Stunden an (ohne Wartezeiten).
*****

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war 'Ja' bei Frage '1 [fb1_ReJN]' (Ihre Reisen im Jahre 2010 Haben Sie im Jahre 2010 eine oder mehrere Reisen ins Ausland gemacht? Bitte berücksichtigen Sie alle Reisen, bei welchen Sie mindestens 2 Nächte auswärts verbracht haben.)

Bitte geben Sie Ihre Antwort hier ein:

8 [fb1_Re1Ja10Da]Wie lange dauerte die Reise insgesamt (inklusive Hin- und Rückreise)?

Bitte geben Sie die Dauer in Tagen an.
*****

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war 'Ja' bei Frage '1 [fb1_ReJN]' (Ihre Reisen im Jahre 2010 Haben Sie im Jahre 2010 eine oder mehrere Reisen ins Ausland gemacht? Bitte berücksichtigen Sie alle Reisen, bei welchen Sie mindestens 2 Nächte auswärts verbracht haben.)

Bitte geben Sie Ihre Antwort hier ein:

9 [fb1_Re1Ja10U]Welche Art von Unterkunft wählten Sie am häufigsten für diese Reise? *

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war 'Ja' bei Frage '1 [fb1_ReJN]' (Ihre Reisen im Jahre 2010 Haben Sie im Jahre 2010 eine oder mehrere Reisen ins Ausland gemacht? Bitte berücksichtigen Sie alle Reisen, bei welchen Sie mindestens 2 Nächte auswärts verbracht haben.)

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Camping
- ○ Jugendherberge
- ○ Bed & Breakfast, Privatunterkunft
- ○ Einfaches Hotel (* oder **), Pension
- ○ Mittelklasse-Hotel (***)
- ○ Hotel, gehobene Klasse (**** oder *****)
- ○ Sonstiges

10 [fb1_Re1Ja10Um]Bitte umschreiben Sie an Hand der unten aufgelisteten Merkmale die Umgebung, in welcher Ihre Reise stattfand.

*

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war 'Ja' bei Frage '1 [fb1_ReJN]' (Ihre Reisen im Jahre 2010 Haben Sie im Jahre 2010 eine oder mehrere Reisen ins Ausland gemacht? Bitte berücksichtigen Sie alle Reisen, bei welchen Sie mindestens 2 Nächte auswärts verbracht haben.)

Bitte wählen Sie alle zutreffenden Antworten aus:

- ☐ Stadt
- ☐ Strand
- ☐ Natur
- ☐ Hotelanlage
- ☐ Golfplatz
- ☐ Meer
- ☐ Schnee
- ☐ Berge
- ☐ Wellness-Anlage
- ☐ See

11 [fb1_Re1Ja10Zw]Weshalb haben Sie diese Reise unternommen?

Bitte beschreiben Sie an Hand der nachfolgenden Stichworte die Gründe, weshalb Sie diese Reise tätigten. *

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war 'Ja' bei Frage '1 [fb1_ReJN]' (Ihre Reisen im Jahre 2010 Haben Sie im Jahre 2010 eine oder mehrere Reisen ins Ausland gemacht? Bitte berücksichtigen Sie alle Reisen, bei welchen Sie mindestens 2 Nächte auswärts verbracht haben.)

Bitte wählen Sie alle zutreffenden Antworten aus:

- ☐ Erholung
- ☐ Dem Alltag entfliehen
- ☐ Mit Freunden/Familie zusammen sein
- ☐ Neue Kontakte knüpfen
- ☐ Flirten
- ☐ Mal keine Verantwortung haben
- ☐ Loslassen
- ☐ Etwas erleben
- ☐ Eine Kultur kennenlernen
- ☐ Gutes Essen
- ☐ Um danach zu Hause davon zu erzählen
- ☐ Mich selber kennenlernen
- ☐ Sportliche Betätigung
- ☐ Sonstiges: _____

12 [fb1_2010Re2JN]Haben Sie im Jahre 2010 noch eine weitere Reise unternommen? *

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war 'Ja' bei Frage '1 [fb1_ReJN]' (Ihre Reisen im Jahre 2010 Haben Sie im Jahre 2010 eine oder mehrere Reisen

ins Ausland gemacht? Bitte berücksichtigen Sie alle Reisen, bei welchen Sie mindestens 2 Nächte auswärts verbracht haben.)

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Ja
- ○ Nein

2011 weitere Reisen

113 [fb1_2011WeitereJN]Haben Sie im Jahre 2011 noch weitere Ausland-Reisen mit mindestens zwei Übernachtungen unternommen? *

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war 'Ja' bei Frage '102 [fb1_2011Re5JN]' (Haben Sie im Jahre 2011 noch eine fünfte Reise unternommen?)

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Ja
- ○ Nein

114 [fb1_weitere_2011]Wieviele? *

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war 'Ja' bei Frage '113 [fb1_2011WeitereJN]' (Haben Sie im Jahre 2011 noch weitere Ausland-Reisen mit mindestens zwei Übernachtungen unternommen?)

Bitte geben Sie Ihre Antwort hier ein:

PN

Im folgenden Abschnitt geht es um Überlegungen, die bei Ihnen während der Planung einer Reise eine Rolle spielen können.

Bitte antworten Sie möglichst spontan.

115 [fb1_pnvi]Stellen Sie sich vor, Sie planen ein verlängertes Wochenende in einer der unten aufgelisteten Städte im näheren Ausland.

Haben Sie das Gefühl, dass Sie "der Umwelt zu Liebe" den Zug nehmen sollten?

*****

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	überhaupt nicht	sehr wenig	wenig	ziemlich	stark	sehr stark
...bei einer Reise nach Wien?	○	○	○	○	○	○
...bei einer Reise nach Rom?	○	○	○	○	○	○
...bei einer Reise nach Berlin?	○	○	○	○	○	○
...bei einer Reise nach Paris?	○	○	○	○	○	○
...bei einer Reise nach Barcelona?	○	○	○	○	○	○
...bei einer Reise nach Amsterdam?	○	○	○	○	○	○

116 [fb1_pnvil]Stellen Sie sich vor, Sie planen, im Sommer für zwei Wochen zu verreisen und machen sich Überlegungen zu möglichen Destinationen.

Haben Sie das Gefühl, dass Sie "der Umwelt zu Liebe" eine Reisedestination wählen sollten, welche ohne Flugzeug erreichbar ist? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ überhaupt nicht
- ○ sehr wenig
- ○ wenig
- ○ ziemlich
- ○ stark
- ○ sehr stark

Intention

Bitte beantworten Sie auch diese Fragen möglichst spontan.

117 [fb1_invi]Stellen Sie sich vor, Sie planen ein verlängertes Wochenende in einer Stadt im näheren Ausland.

Werden Sie für die Anreise den Zug nehmen, wenn die Reise nach ... ? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Auf keinen Fall	Nein	Eher Nein	Eher Ja	Ja	Auf jeden Fall
.. Wien geht?	○	○	○	○	○	○
... Rom geht?	○	○	○	○	○	○
... Berlin geht?	○	○	○	○	○	○
... Paris geht?	○	○	○	○	○	○
... Barcelona geht?	○	○	○	○	○	○
... Amsterdam geht?	○	○	○	○	○	○

118 [fb1_invil]Stellen Sie sich vor, Sie planen, im Sommer für zwei Wochen zu verreisen und machen sich Überlegungen zu möglichen Destinationen.

Werden Sie für diese Reise eine Destination wählen, welche ohne Flugzeug erreichbar ist? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Auf keinen Fall
- ○ Nein
- ○ Eher Nein
- ○ Eher Ja
- ○ Ja
- ○ Auf jeden Fall

UB 1

Es folgen nun ein paar Fragen zu Ihrer Einstellung zu verschiedenen Aspekten der Umweltthematik.

119 [fb1_ub1]Inwiefern stimmen Sie folgenden Aussagen zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Stimme überhaupt nicht zu	Stimme nicht zu	Stimme eher nicht zu	Stimme eher zu	Stimme zu	Stimme voll und ganz zu
Wir erreichen bald die Grenze der Bevölkerungszahl, welche die Erde verkraften kann.	○	○	○	○	○	○
Wenn Menschen in die Natur eingreifen, so hat das oft katastrophale Konsequenzen.	○	○	○	○	○	○
Pflanzen und Tiere haben das gleiche Recht zu existieren wie Menschen.	○	○	○	○	○	○
Die Erde ist wie ein Raumschiff mit sehr beschränktem Raum und Ressourcen.	○	○	○	○	○	○
Das Gleichgewicht der Natur ist sehr empfindlich und wird leicht gestört.	○	○	○	○	○	○

120 [fb1_statement1]Treffen folgende Aussagen auf Sie zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Trifft nicht zu	Trifft zu
Ich verhalte mich generell so, dass ich unserer Umwelt so wenig Schaden wie möglich zufüge.	○	○
Ich würde mich selbst als umweltfreundlich bezeichnen.	○	○

GTO 1

Bitte beantworten sie auch diese Fragen möglichst spontan.

121 [fb1_gto1]Im folgenden Abschnitt geht es um "grüne Technologien" und Ihre Einstellung dazu.

Grüne Technologien sind Technologien, welche zur Lösung von Umweltproblemen beitragen sollen (z.B. sparsame Haushaltsgeräte, erneuerbare Energien, sparsame Transportmittel).

Inwiefern treffen die folgenden Aussagen zu "grünen Technologien" auf Sie zu?

*

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Trifft überhaupt nicht zu	Trifft nicht zu	Trifft eher nicht zu	Trifft eher zu	Trifft zu	Trifft voll und ganz zu
Es stimmt mich optimistisch für unsere Umwelt, wenn ich sehe, wie die Entwicklung grüner Technologien voranschreitet.	○	○	○	○	○	○
Da immer sparsamere Geräte für Haushalt und Alltag auf den Markt kommen, sehe ich der Zukunft gelassen entgegen.	○	○	○	○	○	○
Ich bin sehr optimistisch für unsere Umwelt, da der Einsatz von erneuerbaren Energien (Sonne, Wind, Biogas, Erdwärme) stetig ausgeweitet wird.	○	○	○	○	○	○
Es stimmt mich optimistisch für unsere Umwelt, wenn ich sehe, wie die Fahrzeugflotten des öffentlichen Verkehrs immer umweltfreundlicher werden.	○	○	○	○	○	○
Da unsere Autos immer umweltfreundlicher werden, sehe ich der Zukunft gelassen entgegen.	○	○	○	○	○	○
Ich bin sehr optimistisch für unsere Umwelt, da neu entwickelte Flugzeuge immer weniger Treibstoff benötigen.	○	○	○	○	○	○

UB 2

Bitte beantworten Sie auch diese Fragen möglichst spontan.

122 [fb1_ub2]Inwiefern stimmen Sie folgenden Aussagen zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Stimme überhaupt nicht zu	Stimme nicht zu	Stimme eher nicht zu	Stimme eher zu	Stimme zu	Stimme voll und ganz zu
Menschen haben das Recht, die natürliche Umwelt zu verändern, um ihre Bedürfnisse zu stillen.	○	○	○	○	○	○
Menschen überbeanspruchen die Umwelt in starkem Masse.	○	○	○	○	○	○
Die sogenannte Öko-Krise wird stark überschätzt.	○	○	○	○	○	○
Menschen sind dazu bestimmt, über den Rest der Natur zu bestimmen.	○	○	○	○	○	○

123 [fb1_statement2]Stimmen Sie folgender Aussage zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	stimme nicht zu	stimme zu
Jeder einzelne sollte sich für den Schutz unserer Umwelt einsetzen.	○	○

GTO 2

Bitte beantworten Sie auch diese Fragen möglichst spontan.

124 [fb1_gto2]Inwiefern stimmen Sie den folgenden Aussagen zu "grünen Technologien" zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Stimme überhaupt nicht zu	Stimme nicht zu	Stimme eher nicht zu	Stimme eher zu	Stimme zu	Stimme voll und ganz zu
Dank der stetigen Weiterentwicklung grüner Technologien werden auch unsere Urenkel noch auf einer gesunden Erde wohnen.	○	○	○	○	○	○
Das Umweltproblem wird an Bedeutung verlieren, da Geräte für Haushalt und Alltag immer weniger Energie benötigen.	○	○	○	○	○	○
Dank der Förderung von erneuerbaren Energien (Sonne, Wind, Biogas, Erdwärme), werden auch unsere Urenkel noch auf einer gesunden Erde leben.	○	○	○	○	○	○
Die Umweltprobleme werden abnehmen, da unsere Autos immer weniger Treibstoff benötigen.	○	○	○	○	○	○
Das Umweltproblem wird an Bedeutung verlieren, da Flugzeuge immer weniger Treibstoff benötigen.	○	○	○	○	○	○
Da die Fahrzeugflotten des öffentlichen Verkehrs immer umweltfreundlicher werden, wird das Umweltproblem immer mehr an Bedeutung verlieren.	○	○	○	○	○	○

PW und BH

125 [fb1_pwbh]Inwiefern stimmen Sie folgenden Aussagen zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Stimme überhaupt nicht zu	Stimme nicht zu	Stimme eher nicht zu	Stimme eher zu	Stimme zu	Stimme voll und ganz zu
Der Flugverkehr trägt in grossem Masse zum Klimawandel bei.	○	○	○	○	○	○
Der Anteil des Flugverkehrs am Klimawandel wird von den Medien übertrieben.	○	○	○	○	○	○
Mit einem massvollen Reiseverhalten kann ich zum Erhalt einer intakten Umwelt beitragen.	○	○	○	○	○	○
Wenn ich oft mit dem Flugzeug verreise, so hat das einen Einfluss auf die Umwelt.	○	○	○	○	○	○

Manipulation Check light

126 [fb1_di]Inwiefern treffen folgende Aussagen auf Sie zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Trifft überhaupt nicht zu	Trifft überwiegend nicht zu	Trifft eher nicht zu	Trifft eher zu	Trifft überwiegend zu	Trifft voll und ganz zu
Ich kann mit gutem Gewissen sagen, dass ich meinen Beitrag zum Umweltschutz leiste.	○	○	○	○	○	○
Wenn sich alle so verhalten würden wie ich, sähe es deutlich besser aus um unsere Umwelt.	○	○	○	○	○	○

127 [fb1_random]random

Bitte geben Sie Ihre Antwort hier ein:

Incentive

128 [fb1_Incentive]Als Belohnung für Ihre Mitarbeit erhalten Sie am Ende Ihres Besuches bei uns am Institut entweder 25.- CHF oder (wenn Sie StudentIn am Psychologischen Institut der UZH sind) eine Versuchspersonenstunde.

Bitte geben Sie an, ob Sie 25.- CHF oder eine Versuchspersonenstunde erhalten möchten.

*

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Ich möchte als Belohnung gerne 25.- CHF erhalten.
- ○ Ich möchte als Belohnung gerne eine Versuchspersonenstunde erhalten.

C.3 Questionnaire study II - wave 2

Reisestudie Teil 2

Diese Umfrage enthält 42 Fragen.

Intro

1 [fb2_intro_neutral]Hallo {TOKEN:FIRSTNAME}

Wir möchten uns nochmals bedanken, dass Sie bereits zu Hause den ersten Fragebogen ausgefüllt haben.

Lesen Sie nun auch im zweiten Fragebogen bitte jede Frage sorgfältig durch und antworten Sie möglichst spontan. Ihr erster Eindruck ist meist auch der treffendste.
Ihre Antworten werden selbstverständlich vertraulich behandelt.
Sollten Sie Fragen oder Anmerkungen haben, können Sie sich gerne jederzeit an einen Versuchsleiter wenden.

Wir danken Ihnen im Voraus herzlich für ihre Mitarbeit und wünschen Ihnen viel Vergnügen. Das Ausfüllen dauert ca. 20 min..

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war bei Frage ' []' ()

2 [fb2_Intro_Treatment]Hallo {TOKEN:FIRSTNAME}

Wir möchten uns nochmals bedanken, dass Sie bereits zu Hause den ersten Fragebogen ausgefüllt haben, bei welchem es um Ihre Reisen ging, und was Ihnen dabei wichtig ist.

Ihre Antworten zu den Fragen der Umweltthematik lassen darauf schliessen, dass Ihnen die Umwelt am Herzen liegt und, dass für Sie eine umweltfreundliche Einstellung eigentlich eine Selbstverständlichkeit ist.

Spiegelt sich diese Einstellung auch in Ihrem Reiseverhalten?
{TOKEN:ATTRIBUTE_8}

Lesen Sie nun auch im zweiten Fragebogen bitte jede Frage sorgfältig durch und antworten Sie möglichst spontan. Ihr erster Eindruck ist meist auch der treffendste. Ihre Antworten werden selbstverständlich vertraulich behandelt. Sollten Sie Fragen oder Anmerkungen haben, können Sie sich gerne jederzeit an einen Versuchsleiter wenden.

Wir danken Ihnen im Voraus herzlich für ihre Mitarbeit und wünschen Ihnen viel Vergnügen. Das Ausfüllen dauert ca. 20 min..

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war bei Frage ' []' ()

Reisepersistenz

Es geht los. Bitte beantworten Sie die folgenden Fragen möglichst spontan.

Im ersten Frageblock geht es um die Frage, ob Reisen die persönliche Entwicklung beeinflusst.

3 [fb2_persistenz]Denken Sie, es ist für Ihre persönliche Entwicklung wichtig, möglichst viele Orte besucht zu haben? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Ja
- ○ Nein

4 [fb2_persistenz Erklä]Begründung *

Bitte geben Sie Ihre Antwort hier ein:

5 [fb2_persistenz_ex]Denken Sie, es ist für Ihre persönliche Entwicklung wichtig, möglichst exotische Orte besucht zu haben? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Ja
- ○ Nein

6 [fb2_persisten Erklä2]Begründung *

Bitte geben Sie Ihre Antwort hier ein:

7 [fb2_persistenz_weit]Denken Sie, es ist für Ihre persönliche Entwicklung wichtig, möglichst weit entfernte Orte besucht zu haben? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Ja
- ○ Nein

8 [fb2_persisten Erklä3]Begründung *

Bitte geben Sie Ihre Antwort hier ein:

Gewissenhaftigkeit und Soziale Erwünschtheit

In diesem Frageblock geht es allgemeine Fragen zu Ihrer Persönlichkeit. Bitte antworten Sie möglichst spontan.

9 [fb2_Ge]Inwiefern treffen folgende Aussagen auf Sie zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Trifft überhaupt nicht zu	Trifft überwiegend nicht zu	Trifft eher nicht zu	Trifft eher zu	Trifft überwiegend zu	Trifft voll und ganz zu
Ich halte meine Sachen ordentlich und sauber.	○	○	○	○	○	○
Ich kann mir meine Zeit recht gut einteilen, sodass ich meine Angelegenheiten rechtzeitig beende.	○	○	○	○	○	○
Ich versuche, alle mir übertragenen Aufgaben sehr gewissenhaft zu erledigen.	○	○	○	○	○	○
Wenn ich eine Verpflichtung eingehe, so kann man sich auf mich bestimmt verlassen.	○	○	○	○	○	○
Ich werde wohl niemals fähig sein, Ordnung in mein Leben zu bringen.	○	○	○	○	○	○
Ich bin eine tüchtige Person, die ihre Arbeit immer erledigt.	○	○	○	○	○	○

10 [fb2_se1]Bitte geben Sie für die folgenden Aussagen an, ob die jeweilige Aussage auf Sie zutrifft. *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Trifft nicht zu	Trifft zu
Manchmal werfe	○	○

	Trifft nicht zu	Trifft zu
ich Müll einfach in die Landschaft oder auf die Strasse.		
Eigene Fehler gebe ich stets offen zu und ertrage gelassen etwaige negative Konsequenzen.	○	○
Im Strassenverkehr nehme ich stets Rücksicht auf die anderen Verkehrsteilnehmer.	○	○
Ich habe schon einmal Drogen (Tabletten, Haschisch oder "ähnliches") konsumiert.	○	○
Ich akzeptiere alle anderen Meinungen, auch wenn sie mit meiner eigenen nicht übereinstimmen.	○	○
Meine Wut oder schlechte Laune lasse ich hin und wieder an unschuldigen oder schwächeren Leuten aus.	○	○
Ich habe schon einmal jemanden ausgenutzt oder übers Ohr gehauen.	○	○
In einem Gespräch lasse ich den anderen stets ausreden und höre ihm aufmerksam zu.	○	○
Ich zögere niemals, jemandem in einer Notlage beizustehen.	○	○

11 [fb2_se2]Bitte geben Sie für die folgenden Aussagen an, ob die jeweilige Aussage auf Sie zutrifft. *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Trifft nicht zu	Trifft zu
Wenn ich etwas versprochen habe, halte ich es ohne Wenn und Aber.	○	○
Ich lästere gelegentlich über andere hinter deren Rücken.	○	○
Ich würde niemals auf Kosten der Allgemeinheit leben.	○	○
Ich bleibe immer freundlich und zuvorkommend anderen Leuten gegenüber, auch wenn ich selbst gestreßt bin.	○	○
Im Streit bleibe ich stets sachlich und objektiv.	○	○
Ich habe schon einmal geliehene Sachen nicht zurückgegeben.	○	○
Ich ernähre mich stets gesund.	○	○
Manchmal helfe ich nur, weil ich eine Gegenleistung erwarte.	○	○

PN

Im folgenden Abschnitt geht es um Überlegungen, die bei Ihnen während der Planung einer Reise eine Rolle spielen können.

Bitte antworten Sie möglichst spontan.

12 [fb2_pnvil]Stellen Sie sich vor, Sie planen, im Sommer für zwei Wochen zu verreisen und machen sich Überlegungen zu möglichen Destinationen.

Haben Sie das Gefühl, dass Sie "der Umwelt zu Liebe" eine Reisedestination wählen sollten, welche ohne Flugzeug erreichbar ist? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ überhaupt nicht
- ○ sehr wenig
- ○ wenig
- ○ ziemlich
- ○ stark
- ○ sehr stark

13 [fb2_pnvi]Stellen Sie sich vor, Sie planen ein verlängertes Wochenende in einer der unten aufgelisteten Städte im näheren Ausland.

Haben Sie das Gefühl, dass Sie "der Umwelt zu Liebe" den Zug nehmen sollten?

***

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	überhaupt nicht	sehr wenig	wenig	ziemlich	stark	sehr stark
...bei einer Reise nach Wien?	○	○	○	○	○	○
...bei einer Reise nach Rom?	○	○	○	○	○	○
...bei einer Reise nach Berlin?	○	○	○	○	○	○
...bei einer Reise nach Paris?	○	○	○	○	○	○
...bei einer Reise nach Barcelona?	○	○	○	○	○	○
...bei einer Reise nach Amsterdam?	○	○	○	○	○	○

Soziale Beziehungen international

Reisen werden unter anderem auch getätigt, um Freunde und Bekannte zu besuchen.

14 [fb2_beziehungen]Haben Sie Freunde und/oder Verwandte im Ausland? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Ich habe Freunde im Ausland.
- ○ Ich habe Verwandte im Ausland
- ○ Ich habe Freunde UND Verwandte im Ausland.
- ○ Nein, weder noch.

15 [fb2_bez_freq]Wie oft im Jahr besuchen Sie diese? *

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war 'Ich habe Freunde UND Verwandte im Ausland.' oder 'Ich habe Verwandte im Ausland' oder 'Ich habe Freunde im Ausland.' bei Frage '14 [fb2_beziehungen]' (Haben Sie Freunde und/oder Verwandte im Ausland?)

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Nie	Einmal	Zweimal	Viermal	Fünfmal	Sechsmal	Mehr als sechsmal
Freunde im Ausland	○	○	○	○	○	○	○
Verwandte im Ausland	○	○	○	○	○	○	○

Intention

Bitte beantworten Sie auch die folgenden Fragen möglichst spontan.

16 [fb2_invil]Stellen Sie sich vor, Sie planen, im Sommer für zwei Wochen zu verreisen und machen sich Überlegungen zu möglichen Destinationen.

Werden Sie für diese Reise eine Destination wählen, welche ohne Flugzeug erreichbar ist? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Auf keinen Fall
- ○ Nein
- ○ Eher Nein
- ○ Eher Ja
- ○ Ja
- ○ Auf jeden Fall

17 [fb2_invi]Stellen Sie sich vor, Sie planen ein verlängertes Wochenende in einer Stadt im näheren Ausland.

Werden Sie für die Anreise den Zug nehmen, wenn die Reise nach ... ? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Auf keinen Fall	Nein	Eher Nein	Eher Ja	Ja	Auf jeden Fall
.. Wien geht?	○	○	○	○	○	○
... Rom geht?	○	○	○	○	○	○
... Berlin geht?	○	○	○	○	○	○
... Paris geht?	○	○	○	○	○	○
... Barcelona geht?	○	○	○	○	○	○
... Amsterdam geht?	○	○	○	○	○	○

UB 1

Es folgen nun ein paar Fragen zu Ihrer Einstellung zu verschiedenen Aspekten der Umweltthematik.

18 [fb2_ub1]Inwiefern stimmen Sie folgenden Aussagen zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Stimme überhaupt nicht zu	Stimme nicht zu	Stimme eher nicht zu	Stimme eher zu	Stimme zu	Stimme voll und ganz zu
Wir erreichen bald die Grenze der Bevölkerungszahl, welche die Erde verkraften kann.	○	○	○	○	○	○
Wenn Menschen in die Natur eingreifen, so hat das oft katastrophale Konsequenzen.	○	○	○	○	○	○
Pflanzen und Tiere haben das gleiche Recht zu existieren wie Menschen.	○	○	○	○	○	○
Die Erde ist wie ein Raumschiff mit sehr beschränktem Raum und Ressourcen.	○	○	○	○	○	○
Das Gleichgewicht der Natur ist sehr empfindlich und wird leicht gestört.	○	○	○	○	○	○

GTO 1

19 [fb2_gto1]Im folgenden Abschnitt geht es um "grüne Technologien" und Ihre Einstellung dazu.

Grüne Technologien sind Technologien, welche zur Lösung von Umweltproblemen beitragen sollen (z.B. sparsame Haushaltsgeräte, erneuerbare Energien, sparsame Transportmittel).

Inwiefern treffen die folgenden Aussagen zu "grünen Technologien" auf Sie zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Trifft überhaupt nicht zu	Trifft nicht zu	Trifft eher nicht zu	Trifft eher zu	Trifft zu	Trifft voll und ganz zu
Es stimmt mich optimistisch für unsere Umwelt, wenn ich sehe, wie die Entwicklung grüner Technologien voranschreitet.	○	○	○	○	○	○
Da immer sparsamere Geräte für Haushalt und Alltag auf den Markt kommen, sehe ich der Zukunft gelassen entgegen.	○	○	○	○	○	○
Ich bin sehr optimistisch für unsere Umwelt, da der Einsatz von erneuerbaren Energien (Sonne, Wind, Biogas, Erdwärme) stetig ausgeweitet wird.	○	○	○	○	○	○
Es stimmt mich optimistisch für unsere Umwelt, wenn ich sehe, wie die Fahrzeugflotten des öffentlichen Verkehrs immer umweltfreundlicher werden.	○	○	○	○	○	○

	Trifft überhaupt nicht zu	Trifft nicht zu	Trifft eher nicht zu	Trifft eher zu	Trifft zu	Trifft voll und ganz zu
Da unsere Autos immer umweltfreundlicher werden, sehe ich der Zukunft gelassen entgegen.	○	○	○	○	○	○
Ich bin sehr optimistisch für unsere Umwelt, da neu entwickelte Flugzeuge immer weniger Treibstoff benötigen.	○	○	○	○	○	○

Soziodemographie Teil 1

Bitte machen Sie hier ein paar Angaben zu Ihrer Person.

20 [fb2_sex]Bitte geben Sie Ihr Geschlecht an. *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ weiblich
- ○ männlich

21 [fb2_age]Bitte geben Sie hier Ihr Alter in Jahren an. *

Bitte geben Sie Ihre Antwort hier ein:

[ ]

22 [fb2_Bi]Welches ist Ihr höchster schulischer Abschluss? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Kein Abschluss
- ○ Obligatorische Schule (Primar-, Real-, Sekundar-, Bezirksschule)
- ○ Berufslehre
- ○ Gymnasiale Maturität, Fachmittelschule (z.B. Handelsschule, BMS, DMS)
- ○ Höhere Fachschule (z.B. eidg. Fach- oder Meisterdiplom)
- ○ Fachhochschule
- ○ Universitäre Hochschule (z.B. ETH, Universität, HSG) - 3 Jahre (Bachelor)
- ○ Universitäre Hochschule (z.B. ETH, Universität, HSG) - 5 Jahre (Master; Liz)
- ○ Universitäre Hochschule (z.B. ETH, Universität, HSG) - Doktorat

UB 2

Bitte beantworten Sie auch diese Fragen möglichst spontan.

23 [fb2_ub2]Inwiefern stimmen Sie folgenden Aussagen zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Stimme überhaupt nicht zu	Stimme nicht zu	Stimme eher nicht zu	Stimme eher zu	Stimme zu	Stimme voll und ganz zu
Menschen haben das Recht, die natürliche Umwelt zu verändern, um ihre Bedürfnisse zu stillen.	○	○	○	○	○	○
Menschen überbeanspruchen die Umwelt in starkem Masse.	○	○	○	○	○	○
Die sogenannte Öko-Krise wird stark überschätzt.	○	○	○	○	○	○
Menschen sind dazu bestimmt, über den Rest der Natur zu bestimmen.	○	○	○	○	○	○

GTO 2

Bitte beantworten Sie auch diese Fragen möglichst spontan.

24 [fb2_gto2]
Inwiefern stimmen Sie den folgenden Aussagen zu "grünen Technologien" zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Stimme überhaupt nicht zu	Stimme nicht zu	Stimme eher nicht zu	Stimme eher zu	Stimme zu	Stimme voll und ganz zu
Dank der stetigen Weiterentwicklung grüner Technologien werden auch unsere Urenkel noch auf einer gesunden Erde wohnen.	○	○	○	○	○	○
Das Umweltproblem wird an Bedeutung verlieren, da Geräte für Haushalt und Alltag immer weniger Energie benötigen.	○	○	○	○	○	○
Dank der Förderung von erneuerbaren Energien (Sonne, Wind, Biogas, Erdwärme), werden auch unsere Urenkel noch auf einer gesunden Erde leben.	○	○	○	○	○	○
Die Umweltprobleme werden abnehmen, da unsere Autos immer weniger Treibstoff benötigen.	○	○	○	○	○	○
Das Umweltproblem wird an Bedeutung verlieren, da Flugzeuge immer	○	○	○	○	○	○

	Stimme überhaupt nicht zu	Stimme nicht zu	Stimme eher nicht zu	Stimme eher zu	Stimme zu	Stimme voll und ganz zu
weniger Treibstoff benötigen.						
Da die Fahrzeugflotten des öffentlichen Verkehrs immer umweltfreundlicher werden, wird das Umweltproblem immer mehr an Bedeutung verlieren.	○	○	○	○	○	○

PW und BH

25 [fb2_pwbh]Inwiefern stimmen Sie folgenden Aussagen zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Stimme überhaupt nicht zu	Stimme nicht zu	Stimme eher nicht zu	Stimme eher zu	Stimme zu	Stimme voll und ganz zu
Der Flugverkehr trägt in grossem Masse zum Klimawandel bei.	○	○	○	○	○	○
Der Anteil des Flugverkehrs am Klimawandel wird von den Medien übertrieben.	○	○	○	○	○	○
Mit einem massvollen Reiseverhalten kann ich zum Erhalt einer intakten Umwelt beitragen.	○	○	○	○	○	○
Wenn ich oft mit dem Flugzeug verreise, so hat das einen Einfluss auf die Umwelt.	○	○	○	○	○	○

Soziodemographie 2

Bitte machen Sie hier nochmals ein paar Angaben zu Ihrer Person.

26 [fb2_anz_mitbewohner]Wieviele erwachsene Personen leben in Ihrem Haushalt? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ mehr als 6

27 [fb2_Ei]Wie gross ist das monatliche Bruttoeinkommen aller Haushaltsmitglieder? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ <3’500
- ○ 3501 - 5500
- ○ 5501 - 8500
- ○ 8501 - 12’000
- ○ >12’000

28 [fb2_Erw]Wie sieht Ihre momentane Erwerbssituation aus? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ In Ausbildung
- ○ nicht erwerbstätig (auf Arbeitssuche)
- ○ teilzeit erwerbstätig (unter 80%)
- ○ voll erwerbstätig (80% und mehr)
- ○ Hausmann/-frau
- ○ RentnerIn
- ○ Sonstiges [ ]

29 [fb2_co2]Haben Sie bereits einmal die CO2-Emissionen Ihrer Flugreise kompensiert (z.B. mit Myclimate)? *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Ja
- ○ Nein

30 [fb2_Co2anz]Wie regelmässig kompensieren Sie Ihre CO2-Emissionen von Flugreisen? *

Beantworten Sie diese Frage nur, wenn folgende Bedingungen erfüllt sind:
° Die Antwort war 'Ja' bei Frage '29 [fb2_co2]' (Haben Sie bereits einmal die CO2-Emissionen Ihrer Flugreise kompensiert (z.B. mit Myclimate)?)

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ nie
- ○ selten
- ○ gelegentlich
- ○ meistens
- ○ immer

Lieblings...

31 [fb2_lieb_des_Land]In welchem Land befindet sich die Reisedestination, welche Ihnen bisher am besten gefallen hat?
*****

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Ägypten
- ○ Äquatorialguinea
- ○ Äthiopien
- ○ Afghanistan
- ○ Albanien
- ○ Algerien
- ○ Andorra
- ○ Angola
- ○ Antigua und Barbuda
- ○ Argentinien
- ○ Armenien
- ○ Aserbaidschan
- ○ Australien
- ○ Bahamas
- ○ Bahrain
- ○ Bangladesch
- ○ Barbados
- ○ Belarus
- ○ Belgien
- ○ Belize
- ○ Benin
- ○ Bhutan
- ○ Bolivien
- ○ Bosnien und Herzegowina
- ○ Botsuana
- ○ Brasilien
- ○ Britische Jungferninseln
- ○ Brunei Darussalam
- ○ Bulgarien
- ○ Burkina Faso
- ○ Burundi
- ○ Chile
- ○ China
- ○ Cookinseln
- ○ Costa Rica
- ○ Côte d'Ivoire
- ○ Dänemark

- ○ St. Kitts und Nevis
- ○ St. Lucia
- ○ St. Vincent und die Grenadinen
- ○ Sudan
- ○ Südafrika
- ○ Suriname
- ○ Swasiland
- ○ Syrien
- ○ São Tomé und Príncipe
- ○ Tadschikistan
- ○ Taiwan
- ○ Tansania
- ○ Thailand
- ○ Timor-Leste
- ○ Togo
- ○ Tonga
- ○ Trinidad und Tobago
- ○ Tschad
- ○ Tschechische Republik
- ○ Türkei
- ○ Tunesien
- ○ Turkmenistan
- ○ Turks- und Caicosinseln
- ○ Tuvalu
- ○ Uganda
- ○ Ukraine
- ○ Ungarn
- ○ Uruguay
- ○ USA / Vereinigte Staaten
- ○ Usbekistan
- ○ Vanuatu
- ○ Venezuela
- ○ Vereinigte Arabische Emirate
- ○ Vietnam

32 [fb2_lieb_des_bezei]Genauere Bezeichnung der Destination *

Bitte geben Sie Ihre Antwort hier ein:

33 [fb2_lieb_des_begr]Bitte beschreiben Sie in wenigen Stichworten, WESHALB dies Ihre "Lieblingsdestination" ist". *

Bitte geben Sie Ihre Antwort hier ein:

Kontrollüberzeugung

Bitte beantworten Sie nun auch die folgenden Fragen möglichst spontan.

34 [fb2_Ko1]Inwieweit stimmen Sie folgenden Aussagen zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Stimme überhaupt nicht zu	Stimme nicht zu	Stimme eher nicht zu	Stimme eher zu	Stimme zu	Stimme voll und ganz zu
Zufällige Geschehnisse bestimmen einen grossen Teil meines Lebens und Alltags.	○	○	○	○	○	○
Ich habe oft einfach keine Möglichkeiten, mich vor Pech zu schützen.	○	○	○	○	○	○
Wenn ich bekomme, was ich will, so spielt Glück meistens auch eine Rolle.	○	○	○	○	○	○
Andere Menschen verhindern oft die Verwirklichung meiner Pläne.	○	○	○	○	○	○
Mein Leben und Alltag werden in vielen Bereichen von anderen Menschen bestimmt.	○	○	○	○	○	○

35 [fb2_Ko2]Inwieweit stimmen Sie folgenden Aussagen zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Stimme überhaupt nicht zu	Stimme nicht zu	Stimme eher nicht zu	Stimme eher zu	Stimme zu	Stimme voll und ganz zu

	Stimme überhaupt nicht zu	Stimme nicht zu	Stimme eher nicht zu	Stimme eher zu	Stimme zu	Stimme voll und ganz zu
Ich habe nur geringe Möglichkeiten, meine Interessen gegen andere Leute durchzusetzen.	○	○	○	○	○	○
Es ist für mich nicht gut, weit im Voraus zu planen, da häufig das Schicksal dazwischenkommt.	○	○	○	○	○	○
Um das zu bekommen, was ich will, muss ich zu anderen Menschen freundlich und zuvorkommend sein.	○	○	○	○	○	○
Es ist reiner Zufall, wenn sich andere Menschen einmal nach meinen Wünschen richten.	○	○	○	○	○	○
Damit meine Pläne eine Chance haben, richte ich mich beim Planen nach den Wünschen anderer Leute.	○	○	○	○	○	○

Reaktanz

36 [fb2_rea1]Inwiefern sind folgende Aussagen auf Sie zutreffend? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	völlig unzutreffend	eher unzutreffend	eher zutreffend	völlig zutreffend
Vorschriften und Verpflichtungen erwecken in mir starke Widerstände.	○	○	○	○
Es reizt mich, anderen zu widersprechen.	○	○	○	○
Auf Verbote reagiere ich gerne mit einem „Jetzt erst recht“.	○	○	○	○
Der Gedanke, von anderen abhängig zu sein, ist mir sehr unangenehm.	○	○	○	○
Ratschläge erlebe ich leicht als Bevormundung.	○	○	○	○

37 [fb2_rea2]Inwiefern sind folgende Aussagen auf Sie zutreffend? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	völlig unzutreffend	eher unzutreffend	eher zutreffend	völlig zutreffend
Es ärgert mich sehr, wenn mich jemand auf Dinge hinweist, die im Grunde selbstverständlich sind.	○	○	○	○
Oft verliere ich die Lust, etwas zu tun, nur weil andere es von mir erwarten.	○	○	○	○
Ich reagiere sehr empfindlich, wenn jemand versucht, meine persönliche Entscheidungsfreiheit einzuengen.	○	○	○	○
Ratschläge und Empfehlungen verleiten mich leicht dazu, das Gegenteil zu tun.	○	○	○	○

	völlig unzutreffend	eher unzutreffend	eher zutreffend	völlig zutreffend
Nur Dinge, die ich freiwillig tue, gelingen mir wirklich gut.	○	○	○	○
Beeinflussungsversuchen widersetze ich mich energisch.	○	○	○	○
Es ärgert mich, wenn mir eine andere Person als Vorbild hingestellt wird.	○	○	○	○

Buchungsvorgang

Bitte geben Sie hier an, wie Sie IN DER REGEL vorgehen, wenn Sie eine Unterkunft resp. ein Hin- und Rückreise buchen.

38 [fb2_buch_Unter]Wie buchen Sie in der Regel Ihre Unterkunft?
*

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Über ein Hotelportal im Internet (z.B. HRS, trivago)
- ○ Direkt bei der Unterkunft, telefonisch
- ○ Direkt bei der Unterkunft, per Email, per Post
- ○ Im Reisebüro, persönliches Gespräch
- ○ Beim Reisebüro, telefonisch
- ○ Beim Reisebüro, per Email, per Post
- ○ Sonstiges [ ]

39 [fb2_buch_tra]Wenn Sie NICHT mit dem privaten Auto reisen...

Wie buchen Sie in der Regel Ihre An- und Rückreise?
*

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Über ein Reiseportal im Internet (z.B. ebookers)
- ○ Direkt beim Transportunternehmen (z.B. SBB, SWISS), am Schalter
- ○ Direkt beim Transportunternehmen (z.B. SBB, SWISS), telefonisch
- ○ Direkt beim Transportunternehmen (z.B. SBB, SWISS), per Email, per Post
- ○ Im Reisebüro, persönliches Gespräch
- ○ Beim Reisebüro, telefonisch
- ○ Beim Reisebüro, per Email, per Post
- ○ Sonstiges [ ]

Manipulation Check

40 [fb2_di]Inwiefern treffen folgende Aussagen auf Sie zu? *

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Trifft überhaupt nicht zu	Trifft überwiegend nicht zu	Trifft eher nicht zu	Trifft eher zu	Trifft überwiegend zu	Trifft voll und ganz zu
Ich kann mit gutem Gewissen sagen, dass ich meinen Beitrag zum Umweltschutz leiste.	○	○	○	○	○	○
Wenn sich alle so verhalten würden wie ich, sähe es deutlich besser aus um unsere Umwelt.	○	○	○	○	○	○
Ich habe manchmal das Gefühl, ich bin weniger umweltfreundlich, als ich vorgebe.	○	○	○	○	○	○
Manchmal bin ich etwas unsicher, wie umweltfreundlich ich wirklich bin.	○	○	○	○	○	○
Wenn ich an mein Reiseverhalten denke, bin ich vielleicht doch nicht so umweltfreundlich.	○	○	○	○	○	○
Ich habe ein schlechtes Gewissen gegenüber der Umwelt, wenn ich an mein Reiseverhalten denke.	○	○	○	○	○	○
Ich habe ein ungutes Gefühl, wenn ich daran denke, wie oft ich mit dem	○	○	○	○	○	○

	Trifft überhaupt nicht zu	Trifft überwiegend nicht zu	Trifft eher nicht zu	Trifft eher zu	Trifft überwiegend zu	Trifft voll und ganz zu
Flugzeug verreise.						

Abschluss

41 [fb2_abschluss_verlos]Gratulation, Sie haben es geschafft!

Unter allen Teilnehmenden verlosen wir je einen Reisegutschein der Schweizerischen Bundesbahnen SBB und der Swiss International Air Lines im Wert von 300.- CHF.

Bitte geben Sie an, an welcher der beiden Verlosungen Sie teilnehmen möchten. *

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ○ Ich möchte gerne an der Verlosung des Reisegutscheins (300.- CHF) der **Schweizerischen Bundesbahnen SBB** teilnehmen.
- ○ Ich möchte gerne an der Verlosung des Reisegutscheins (300.- CHF) der **Swiss International Airlines** teilnehmen.

42 [fb2_verlos_begruend]Bitte begründen Sie mit ein paar Stichworten Ihre Wahl. *

Bitte geben Sie Ihre Antwort hier ein:

D Curriculum vitae

Curriculum vitae

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Education

08/2009 – 04/2013	PhD student in Psychology at University of Zurich
10/1999 – 11/2006	Master of Science in Psychology at University of Zurich Minor subjects: Sociology and Linguistics Master's Thesis: "Verhaltensbestimmende Faktoren der Abfall-Trennung in Santiago de Cuba"
08/1992 – 01/1999	Matura at Literargymnasium Raemibuehl, Zurich
04/1986 – 07/1992	Primary School in Zurich

Professional Experience

08/2009 to present	Department of Psychology (Social Psychology), University of Zurich: Teaching and Research Associate
09/2007 – 02/2013	Center for Social Research (Sozialforschungsstelle), University of Zurich: Project Collaborator
02/2007 – 12/2008	MRC Marketing Research and Consulting, Zug: Project Collaborator
06/1999 – 12/2006	Part-time employments and internships during studies